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CONFRONTING CLIMATE IMPACTS: FEDERAL STRATEGIES FOR EQUITABLE ADAPTATION AND RESILIENCE

HEARING

BEFORE THE

SELECT COMMITTEE ON THE CLIMATE CRISIS HOUSE OF REPRESENTATIVES

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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CONFRONTING CLIMATE IMPACTS: FEDERAL STRATEGIES FOR EQUITABLE ADAPTATION AND RESILIENCE

WEDNESDAY, MARCH 9, 2022

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON THE CLIMATE CRISIS,
Washington, DC.

The Select Committee met, pursuant to call, at 9:34 a.m., in Room 210, Cannon House Office Building, Hon. Kathy Castor [Chair of the Select Committee] presiding.

Present: Representatives Castor, Bonamici, Huffman, Levin, Casten, Escobar, Graves, Palmer, and Carter.

Ms. CASTOR [Presiding.] So good morning, everyone. Thank you for joining us for this hybrid hearing on "Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience."

First, let me say that our hearts are with the people of Ukraine this morning who are living through unimaginable circumstances. And as Democrats, as Republicans, as Americans, we stand on the side of freedom and democracy, and I know we will work together to hold Russia and Putin accountable and to support the brave Ukrainian people. And as we continue to help the people of Ukraine, we must also keep working to respond to the worsening impacts of the climate crisis. Today, we will hear about the need to develop a national adaptation and resilience strategy that focuses on a way to activate all sectors and levels of government to deliver actionable climate risk science, information, and tools by also helping drive the funding and investment for vulnerable communities.

So I will recognize myself right now for a five minute opening statement.

For decades, scientists have warned us that our reliance on fossil fuels is filling the atmosphere with heat trapping pollution, raising global temperatures and fueling extreme weather. They warned us that rising temperatures would lead to worsening disasters, stronger heatwaves, and longer droughts, and those predictions are now our reality. Families and businesses are dealing with the costs and the consequences of climate inaction, and while we can still avoid the worst effects of climate change, some effects now are unavoidable. But it is not too late, however, to avoid some of the worst scenarios if we act now.

While we take ambitious steps to keep climate change from getting worse, we must also urgently confront the impacts that are already here. That means developing a national adaptation and resil-

ience strategy, one that delivers actionable tools and resources to frontline communities across America. It means taking global action to helping communities develop climate resilient economies. It means safeguarding our food and our farmers, and it means investing and strengthening housing and infrastructure, directing growth towards safer ground, and prioritizing investments to our most vulnerable people. We must engage in the adaptation planning designed with local partners, engaging them early and meaningfully so that we can benefit from their insight and experience, and we must do this in ways that are equitable, sustainable, and urgent.

It is one thing to read about climate impacts in a scientific report. It is quite another to feel them in your own neighborhood, but that is what is happening across America. Just last year, climate-fueled disasters affected 1 in 10 American homes, according to an analysis by CoreLogic, and in the summer, the Pacific Northwest experienced a deadly heatwave with record shattering temperatures of more than 110 degrees. The Southwest is in the midst of a 20-plus-year mega drought, the region's most severe in the last 1,200 years. And over the next 30 years, the National Ocean Service estimates that flooding will be 10 times as common in communities, like my own in the Tampa Bay area where sea level could rise as much as 12 inches.

The latest report from the Intergovernmental Panel on Climate Change presents one of the starkest warnings to date. Even if we meet our most ambitious climate goals, the world's leading scientists predict that we will suffer losses. We may lose most of the world's tropical coral reefs by the end of this century as well as much of our glaciers and polar ice. We will continue to lose species and ecosystems at a rapid clip. And if we don't act decisively, we will face widespread human suffering with destabilized food production, water scarcity, and a global economy plagued by uncertainty. It is a dire economic picture that we simply cannot allow to happen. However, the IPCC report also contains a message of hope and of urgency. Every dollar we spend today on adaptation and resilience can save us between $4 and $7 in the future, and investing in resilient infrastructure can save lives and lessen the impacts of extreme weather.

That is why we worked to pass President Biden's Bipartisan Infrastructure Law, which includes the largest investment in resilient physical and natural infrastructure in American history. The infrastructure law invests over $50 billion to protect against droughts, heat, floods, and wildfires. It includes $1 billion for FEMA's Building Resilient Infrastructure and Communities, as well as $3.5 billion for Flood Mitigation Assistance. And it makes historic investments in wildfire resilience, water infrastructure, transportation planning, and grid resilience. But there is still progress to be made because, today, the United States has no comprehensive Federal approach for climate adaptation and resilience planning that builds on what is happening at the local level. The results of an inefficient ad hoc system will exacerbate the risks in our local communities. It will exacerbate risks to our economy and the people we represent.

So today, we will hear from experts on how Congress can help Americans adapt to climate impacts in a way that is equitable for

every community. We will talk about the tools needed to help communities manage unavoidable climate impacts, and we will explore ways to boost resilience across the nation. I am really looking forward to our conversation today. Thank you.

And at this time, I will yield 5 minutes to Ranking Member Graves for his opening statement.

[The statement of Ms. Castor follows:]

Opening Statement of Chair Kathy Castor

Hearing on "Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience"

March 9, 2022

As prepared for delivery

For decades, scientists have warned us that our reliance on fossil fuels is filling the atmosphere with heat-trapping pollution, raising global temperatures, and fueling extreme weather. They warned us that rising temperatures would lead to worsening disasters, stronger heat waves, and longer droughts. Those predictions are now our reality. Families and businesses are dealing with the costs and the consequences of climate inaction. And while we can still avoid the worst effects of climate change, some impacts are now unavoidable. It is not too late, however, to avoid some of the worst scenarios—if we act.

While we take ambitious steps to keep climate change from getting worse, we also must urgently confront the impacts that are already here. That means developing a national adaptation and resilience strategy, one that delivers actionable tools and resources to frontline communities across America. It means taking global action to help communities develop climate-resilient economies. It means safeguarding our food and our farmers. And it means investing in strengthening housing and infrastructure, directing growth toward safer ground, and prioritizing investments for our most vulnerable people. We must also engage in adaptation planning designed with local partners, engaging them early and meaningfully, so we can benefit from their insight and experience. And we must do all this in ways that are equitable, sustainable, and urgent.

It's one thing to read about climate impacts in a scientific report. It's quite another to feel them in your own neighborhood. But that's what's happening across America. Just last year, climate-fueled disasters affected one in ten American homes, according to analysis by CoreLogic. In the summer, the Pacific Northwest experienced a deadly heatwave with record-shattering temperatures of more than 110 degrees. The Southwest is in the midst of a 20-plus-year megadrought, the region's most severe in the last 1,200 years. And over the next 30 years, the National Ocean Service estimates that flooding will be 10 times as common in communities like my own, where sea level could rise as much as 12 inches.

The latest report from the Intergovernmental Panel on Climate Change presents one of the starkest warnings to date. Even if we meet our most ambitious climate goals, the world's leading scientists predict we will suffer losses—we may lose most of the world's tropical coral reefs by the end of the century, as well as much of our glaciers and polar ice. We will continue to lose species and ecosystems at a rapid clip. And if we don't act decisively, we'll face widespread human suffering, with destabilized food production, water scarcity, and a global economy plagued by uncertainty. It's a dire economic picture that we simply cannot allow to happen.

However, the IPCC report also contains a message of hope—and of urgency. Every dollar we spend today on adaptation and resilience can save us between $4 and $7 in the future. And investing in resilient infrastructure can save lives and lessen the impacts of extreme weather. That's why we worked to pass President Biden's Bipartisan Infrastructure Law, which includes the largest investment in resilient physical and natural infrastructure in American history. The Infrastructure Law invests over $50 billion to protect against droughts, heat, floods, and wildfires. It includes $1 billion for FEMA's Building Resilient Infrastructure and Communities program, as well as $3.5 billion for Flood Mitigation Assistance Grants. And it makes historic investments in wildfire resilience, water infrastructure, transportation planning, and grid resilience.

There is still progress to be made. As of today, the United States has no comprehensive federal approach for climate adaptation and resilience planning. That re-

sults in an inefficient, ad hoc system—one that exacerbates risks to our communities, our national economy, and our national security. In order to fully meet this challenge, we must create a national adaptation and resilience strategy that prioritizes vulnerable populations and transitions them away from the riskiest areas. We need to significantly increase technical and financial assistance to vulnerable communities around the world. We need to establish a Climate Risk Information Service to deliver actionable data and tools. And we must ensure federally-funded projects conform to the latest codes and standards for resilience and energy efficiency.

Today, we'll hear from experts on how Congress can help Americans adapt to climate impacts, in a way that's equitable for every community. We'll talk about the tools needed to help communities manage unavoidable climate impacts. And we'll explore ways to boost resilience across the nation. I look forward to our conversation.

Mr. GRAVES. Thank you, Madam Chair. Thank you all for being here. The witnesses and the members, thank you for being here.

You know, resilience is important, and I am very proud we have a great local leader, Parish President Matt Jewell, here from St. Charles Parish. The rest of you have counties, you all haven't caught on yet, but he is the leader of one of our units of local government, our counties, and a guy that was out there waist deep, neck deep in water from Hurricane Ida, throwing sandbags, trying to save his community. Resilience is absolutely critical in Louisiana. And he is going to talk today a little bit about Risk Rating 2.0, about this change within FEMA that has been made that causes extraordinary rate increases in flood insurance for people in his community and in adjacent communities, going somewhere from $560 a year to $7,000, we believe even $9,000 in a year. I don't know. This is insane what is going on. What we need to be doing is protecting communities.

But, Madam Chair, I actually want to go in a little bit different direction today. We are sitting here talking about resilience. This is the Climate Committee. We are supposed to be dealing with climate issues, and all this committee has been doing, all this Congress has been doing is sitting here talking about how we are going to move to renewable energy solutions. That is what we are going to do. We are going to move to renewable energy solutions. We are going to chart this new path on energy. Look at what is happening right now as a result of completely failed governance, a lack of an energy policy. "No" isn't an energy policy. Opposing everything isn't an energy policy.

Look at what is happening today as a result of all of these people out there saying these things that are not tethered to science, are not tethered to data, and the people in the media that are being entirely complicit with it. It is not funny anymore. We have reached maximum gasoline prices. Emissions are going up. We are going from buying oil from Russia to, oh, look, we are going to pivot to Iran and Venezuela. I have people calling me, in fact, including people that are constituents of President Jewell. They are saying I can't afford to fill my car to go to work. It is not funny.

We are not achieving any objectives that you are trying to achieve. None. Emissions are going up as compared to President Trump. Prices are insane, and we have energy insecurity. There is not an energy strategy. We need to be talking about something that is rational, something that is science based, and we are not. We are continuing to talk about how you are going to ride the uni-

corn to the dance with Bigfoot. This is insane. It doesn't make any sense.

We have 38 billion barrels of reserves in the United States, 38 billion barrels of technically proven reserves of oil. We have our European friends that have made dumb decisions, like closing nuclear plant after nuclear plant, therefore, becoming more dependent upon Russia. We have natural gas here. We have trillions and trillions of cubic feet of natural gas that we can produce here. If the Biden Administration will approve more of the export terminals, we can send it over to Europe to help address their issues. Here is a fact that I have said in this committee over and over again: producing gas, natural gas, in the United States has a lower environmental footprint, lower emissions than virtually any other country in the world.

Do you know the production in the United States that is effectively the cleanest with the lowest emissions? It is producing in the offshore, off the coast of where President Jewell represents, the area where we represent, lowest emissions in the world, some of the lowest emissions, but, no, we are going to turn to Vladimir Putin? We are going to turn to Iran? We are going to turn to Maduro and Venezuela. We are going to turn to the Saudis. Who thinks this makes sense? We have higher prices, higher emissions, and less energy security. This guts our economy. There is not a strategy. No is not a strategy.

Back to the offshore production, what was one of the first actions of this Administration? Signing an executive order saying we are not going to do any new leases, so now there is a lawsuit. They told them they had to do it, then told them they don't have to do it, and the Administration is just sitting there on it. We have the solutions in the United States. At the State of Union Address the other night, the President said, "We want to buy America." We want to buy America or American. We have energy right here. We had energy security, we had energy independence, and it was given up through a failed strategy.

I want to be clear, Madam Chair: solar, wind, nuclear, hydro, geothermal, wave, all of them play a role, every single one of them, but "no" is not an energy strategy, and look at what we are doing to this country. This is a disaster. And this shouldn't be a partisan fight, but we can't continue to sit around here and talk about things that are completely illogical, irrational, and are causing the impact to the American people that we are seeing today.

I yield back.

Ms. CASTOR. All right. I thank the gentleman from Louisiana. By the way, I am going to go ahead and introduce our witnesses, but we will be going into recess at some point because we are going to take a vote today on banning oil and gas exports from Putin, from Russia. So I know you may want to——

Mr. GRAVES. I can't wait.

Ms. CASTOR [continuing]. Correct your remarks when you say we are dealing with Putin, and oil and gas, because we are going to ban oil and gas exports, just like President Biden said.

Okay. So I want to welcome our witnesses today. We have an outstanding panel.

Dr. William Solecki is a Professor in the Department of Geography and Environmental Science at Hunter College in City University of New York, an expert in urban environmental change, resilience, and adaptation. Dr. Solecki founded the CUNY Institute for Sustainable Cities, which works to makes cities part of the solution to sustainability challenges. He was an author of the U.N. Intergovernmental Panel on Climate Change Working Group II "Summary for Policymakers," and chapters on climate risk cities, and the coordinating lead author of the U.S. National Climate Assessment chapter on "Urbanization, Infrastructure, and Vulnerability."

Dr. Lara Hansen is the Executive Director and Chief Scientist at EcoAdapt. Dr. Hansen leads EcoAdapt's work to support professionals in adaptation and management sectors. She serves on the U.N. Intergovernmental Panel on Climate Change and is a United States Environmental Protection Agency bronze medalist. Dr. Hansen previously worked as the Chief Climate Change Scientist for the World Wildlife Fund where she created their International Climate Change Impacts and Adaptation Program.

Would you like to introduce Mr. Jewell?

Mr. GRAVES. Sure. Madam Chair, we are joined again by St. Charles Parish President Matt Jewell. President Jewell—I remind you again we have parishes in Louisiana, not counties—is the chief executive elected official for the parish. President Jewell grew up in St. Charles Parish. He actually worked up here and did staff work with Congressman Scalise, worked for the United States Department of Energy, is a fellow beekeeper, and I will tell you just a great guy that has the heart and soul, complete passion for the parish and compassion for the people that he represents. And I think you will see in his testimony today what a great resource and perspective he will be providing to the committee.

Ms. CASTOR. Thank you. And Dr. Lauren Alexander Augustine is the Executive Director of the Gulf Research Program at the National Academies of Science, Engineering, and Medicine. An expert in water, natural disasters, and resilience, Dr. Augustine currently oversees the management and use of criminal settlement funds directed to the National Academies from the Deepwater Horizon disaster. She previously led efforts to build community resilience at the Resilient America Program and as the Country Director for the African Science Academy Development Initiative.

Welcome to all of our panelists, and without objection, the witness' written statements will be made part of the record.

With that, Dr. Solecki, you are now recognized to give a 5-minute presentation of your testimony. Welcome.

Dr. SOLECKI. Great. Thank you. Can you guys hear me?

Ms. CASTOR. Yes, we can.

Dr. SOLECKI. Okay. Thank you.

STATEMENTS OF DR. WILLIAM SOLECKI, DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SCIENCE, HUNTER COLLEGE, CITY UNIVERSITY OF NEW YORK (CUNY); DR. LARA J. HANSEN, EXECUTIVE DIRECTOR AND CHIEF SCIENTIST, ECOADAPT; THE HONORABLE MATTHEW JEWELL, PRESIDENT, ST. CHARLES PARISH, LOUISIANA; AND DR. LAUREN ALEXANDER AUGUSTINE, EXECUTIVE DIRECTOR, GULF RESEARCH PROGRAM, NATIONAL ACADEMIES OF SCIENCE, ENGINEERING, AND MEDICINE

STATEMENT OF DR. WILLIAM SOLECKI

Dr. SOLECKI. Ms. Castor, Ranking Member Graves, and members of the Select Committee, thank you for inviting me today, and thank you for your commitment to the climate change issue. What I am going to do is speak about the report and some of the findings from it.

A key statement that comes out of the summary for policymakers from that report released last week is that the cumulative scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a livable future. The report content really highlights an advanced understanding of climate change driven impacts, including many significant shifts that increase the risks faced by the world's ecosystems and society. Simply put, climate change at the national and global scales is not something that can be ignored, it is not going away, and the impacts are going to become increasingly worse. But as was noted, we have a clear window of opportunity to act, particularly in this next decade.

The report presents a clear and compelling assessment of widespread global impacts of climate change. Evidence also continues to strengthen the assessment that the impacts will increase significantly if and when global warming exceeds 1.5 degrees Celsius, or about 2.7 degrees Fahrenheit, with approximately about 1.1 degree of warming already observed. For North America, some of the key impacts observed in the report include the following: climate change has negatively impacted human health and well-being; food production is increasingly affected by climate change; extreme events and climate hazards are adversely affecting economic activities across the U.S. and have disrupted supply chain infrastructure and trade; North American cities and settlements have been impacted increasingly by severe and frequent climate hazards and extreme events, which have contributed to infrastructure damage, livelihood losses, damage to heritage resources, and safety concerns; and terrestrial, and marine, and freshwater ecosystems are all being profoundly altered by climate change across the region.

The report also assesses what to expect in the near future in terms of future risk but also talks more specifically about where and why adaptation is being effective or not. And one of the things that is really relevant here is that there is some good news. The good news is that more and more adaptation strategies are being planned, developed, and implemented. Many pilot projects and local experiments are ongoing, and various types of infrastructural, technological, and societal ecosystem-based adaptations are being

developed, which provide a basis for ongoing improvement and scaling up. Also, many enabling factors that promote adaptation have been defined in the assessment as well. These include a focus on inclusive governance access to financing, access to new and cutting edge knowledge, as well as decision making that focuses on issues of equity.

The bad news, though, is that what we also find with respect to adaptation is that, in some cases, it is not sufficient to meet the challenge of climate change, what we define as an adaptation gap. In other cases, it is leading to unintended outcomes or maladaptation. Also, we find that a lot of adaptation lacks coordination, monitoring, and evaluation, and, in some cases, it is losing its effectiveness with respect to shifts in climate change already ongoing.

What I would like to do in my last minute or so is to sort of talk about some of these opportunities for taking advantage of this window that we now have present to us. One is to enhance conditions for adaptation; two, to focus on enhancing synergies and co-benefits of adaptation that reduce maladaptation; enhance our monitoring and evaluation capacity; incorporate adaptation into the everyday practice, particularly with the development of sector- and geographic-specific relevant metrics, standards, and codes; prepare for shocks that are, in some cases, outside the remit of the jurisdiction of agencies and learn from them as best as possible; and also develop a suite of policies that are flexible, adaptive, and also present a diverse set of strategies. And finally, one of the key results is this issue of more fully integrating and connecting adaptation, and mitigation, and development, and the recognition that this sort of interleaving of these three key aspects provide great opportunities for climate solutions in the future.

Thank you.

[The statement of Dr. Solecki follows:]

Testimony of William Solecki, Ph.D., Professor
Dept. of Geography and Environmental Science, Hunter College-City University of New York
U.S. House of Representatives Select Committee on the Climate Crisis

Report from the *Intergovernmental Panel on Climate Change, Working Group II Report: Impacts, Adaptation, and Vulnerability*
March 9, 2022

Chair Castor, Ranking Member Graves, and members of the Select Committee, thank you for inviting me here today and for your commitment to the climate change issue.

The key concluding statement from the *IPCC Working Group II Report, Summary for Policymakers* released on Monday February 28, 2022 is that, **the cumulative scientific evidence is unequivocal: climate change is a threat to human wellbeing and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.**

The report highlights an advanced understanding of climate change driven impacts, including many significant shifts that increase the risks faced by world's ecosystems and society. Simply put, climate change at the national and global scales is not something that can be ignored, it is not going away, and the impacts are going to become increasingly worse, but we do have a clear window of opportunity if we are able to act in the near term, especially in the next decade.[1]

[1] This statement includes a distillation of the key points from the IPCC Working Group II Report with interpretation and review by the author. The full report can be found at https://report.ipcc.ch/ar6wg2/pdf/IPCC_AR6_WGII_FinalDraft_FullReport.pdf.

The report presents a clear and compelling assessment of the widespread global impacts of climate change. Impacts are being observed everywhere on the globe. This is a significant advance over the previous IPCC report released in March of 2014. Key issues now noted include compound and cascading risks, a wide spatial variation in the level of risk, and deepening vulnerability of ecosystems and society. For example, 3.3 to 3.6 billion people now live in global hotspots of high vulnerability to climate change. These are across large parts of Africa, as well as South Asia, Central and South America, small islands and the Arctic. Coastal tidal sites and small islands are also especially at risk and vulnerable. Evidence continues to strengthen assessment that climate impacts will increase significantly if and when global warming exceeds 1.5°C (2.7°F) with approximately 1.1°C of warming already observed.

In North America, key impacts include the following observations. Climate change has negatively impacted human health and wellbeing; food production is increasingly affected by climate change; extreme events and climate hazards are adversely affecting economic activities across the U.S. and have disrupted supply-chain infrastructure and trade; North American cities and settlements have been affected by increasing severity and frequency of climate hazards and extreme events; which have contributed to infrastructure damage, livelihood losses, damage to heritage resources, and safety concerns. Terrestrial, marine, and freshwater ecosystems also are being profoundly altered by climate change across the region. Given these observations, the report assesses what we can expect about the near-term future risk (current to 2040) and beyond, and where and why climate adaptation might be effective or not.

1. NEAR-TERM FUTURE RISK (2021–2040) AND BEYOND

In Chapter 14 of the report key near-term future risks for North America are assessed (Note—confidence levels from the report are included). Climate hazards are projected to intensify further across North America (very high confidence). Heat waves over land and in the ocean as well as wildfire activity will intensify; sub-Arctic snowpack, glacial mass and sea ice will decline (virtually certain); and sea level rise will increase at geographically differential rates (virtually certain). Humidity-enhanced heat stress, aridification, and extreme precipitation events that lead to severe flooding, erosion, debris flows, and ultimately loss of ecosystem function, life and property are projected to intensify (high confidence). With respect to specifics, health risks are projected to increase this century under all future emissions scenarios (very high confidence). Climate-induced redistribution and declines in North American food production are a risk to future food and nutritional security (very high confidence). Escalating climate change impacts on marine, freshwater, and terrestrial ecosystems (high confidence) will alter ecological processes (high confidence) and amplify other anthropogenic threats to protected and iconic species and habitats (high confidence).

2. CLIMATE ADAPTATION—WHAT IS WORKING, WHAT IS NOT, AND WHAT IS NEEDED

Climate adaptation is a broad term associated with development of actions including policies and strategies that reduce the exposure, risk, and vulnerability of communities, assets, and economies and ecosystems to climate change. The good news is that the assessment reported that adaptation strategies are being planned, developed, and implemented to a greater and greater amount. Many pilot projects and local experiments are ongoing and exploring various types of infrastructural, technical, societal and ecosystem-based adaptation, providing a basis for ongoing improvement and scaling up. The bad news is that the scale of adaptation is not sufficient to meet the challenge of climate change, is in some cases leading to unintended outcomes, is not well coordinated, monitored or evaluated, and is at risk of rapidly losing its effectiveness because of shifts driven by climate change itself. Several key terms and concepts assessed in the report and presented below are relevant to this discussion.

2.1 Adaptation gap—The capacity to adapt to climate change is highly variable and there are increasing gaps between adaptation action taken and what's needed. Action on adaptation has increased but progress is uneven and societies are not adapting fast enough. This adaptation gap is largest among lower income marginalized communities. At the current rate of planning and implementation, the adaptation gap will continue to grow. In cities for example, we see globally that the gap between what can be adapted to and what has been implemented is uneven. The gap is larger for the poorest 20% of the population than for the wealthiest 20%. Adaptation options can be taken in every region and every sector to respond to climate change however, the assessment finds that the effectiveness of some action declines with increased warming, in turn, also creating a wider adaptation gap.

2.2 Hard and soft limits to adaptation—The capacity to adapt to climate change is associated with limits. Adaptation limits point to conditions at which an actor's objectives (or system needs) cannot be secured from intolerable risks through adaptive actions. Hard adaptation limits are present when no adaptive actions are possible to avoid intolerable risks. Soft adaptation limits are present when options may exist but are currently not available to avoid intolerable risks through adaptive action. Poverty and inequality both present significant adaptation limits, resulting in unavoidable impacts for vulnerable groups. In cities, soft limits to adaptation are associated with low governance capacity, limited political commitment, limited financial support, lack of reliable information, and the legacy of past urban infrastructure investment that constrain how cities and settlements are able to adapt.

2.3 Maladaptation—The report also found increased evidence of maladaptation or adaptation actions that have unintended side-effects. Maladaptation may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future. One example to highlight are hard infrastructure sea walls to protect against coastal flooding that might be not sufficient to fully protect against increased future risk of flooding. Also in the urban context, the shift to increased air conditioning use to protect against heat stress will increase GHG emissions. Overall, the report highlights that, cities and settlements are best protected when they use a range of strategies to adapt to climate change and hard infrastructure by itself can be maladaptive or less effective over time. Adaptation strategies are most effective when they are diverse and flexible in the face of dynamic climate risk conditions. The report also highlights the value of ecosystem approaches and nature-based strategies—i.e., green infrastructure that could also be considered in the urban adaptation portfolio.

2.4 Climate equity and justice—An emerging significant finding in the report is the critical role that justice and equity [2] play in the levels of climate vulnerability, adaptation and broader scale responses. Vulnerability of populations to climate change differs substantially among and within regions, driven by patterns of intersecting socio-economic development, unsustainable ocean and land use, marginalization, historical and ongoing patterns of inequity, and governance. Inequity and poverty lead to soft adaptation limits, resulting in disproportionate exposure and impacts for most vulnerable groups. Furthermore, adaptation planning and implementation that do not consider adverse outcomes for different groups can lead to maladaptation, increasing exposure to risks, marginalizing people from certain socio-economic or livelihood groups, and exacerbating inequity. Conversely, inclusive governance that prioritizes equity and justice in adaptation planning and implementation leads to more effective and sustainable adaptation outcomes. Integrated and inclusive system-oriented solutions based on equity and social and climate justice reduce risks and enable climate resilient development.

2.5 Enabling conditions for climate adaptation—To accelerate and sustain adaptation requires political commitment and follow-through across all levels of government through legal, legislative and regulatory pathways; clear goals, defined responsibilities and commitments; access to and mobilizing adequate financial and technical resources; decision-support tools, cutting edge, actionable knowledge, and monitoring and evaluation to track progress; and inclusive governance that prioritizes equity and justice in adaptation planning and implementation.

2.6 Monitoring and evaluation of adaptation—Monitoring and evaluation (M&E) are key for iterative climate risk management, in particular tracking adaptation progress and learning about adaptation success and maladaptation. M&E application in the past five years has increased at the local, project and national level, but is still at an early stage and underutilized as a way to assess adaptation outcomes at longer timeframes. About one-third of world's countries have undertaken steps to develop national adaptation M&E systems, but fewer than half of these are reporting on implementation. The relative strength and weaknesses of different M&E approaches and their applicability have not been systematically assessed, but the diversity of approaches being used could provide a more comprehensive assessment of national and global adaptation progress.

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[2] In the report, justice is concerned with setting out the moral or legal principles of fairness and equity in the way people are treated, often based on the ethics and values of society. Social justice comprises just or fair relations within society that seek to address the distribution of wealth, access to resources, opportunity and support according to principles of justice and fairness. Climate justice comprises justice that links development and human rights to achieve a rights-based approach to addressing climate change.

3. WINDOW OF OPPORTUNITY AND INTEGRATED FLEXIBLE ADAPTATION RESPONSE

While the report highlights growing climate risk facing ecosystems and society and the challenges associated with ongoing response efforts, the assessment also reveals a series of conditions, situations and pathways that provide increased effectiveness of climate adaptation. The report documents an existing yet rapidly closing window of opportunity to act to limit the most adverse climate change impacts. Action in the next ten years will be crucial. To take full advantage of this window of opportunity, one can consider rapidly enhancing current adaptation practice and simultaneously advancing adaptation practices and link them with strategies to rapidly reduce greenhouse gas emissions and prospects for economic development that will promote sustainable development. Given the rapidly increasing climate risk and complex and diverse local conditions, it is important to advance policies and practices that are flexible and adaptive to specific contexts. Overall, taking integrated action for climate resilience to avoid climate risk requires urgent decision making regarding the new built environment and the retrofitting existing designs, infrastructure and land use. The assessment defines a series of conditions associated with taking advantage of the current window of opportunity.

3.1 Advance enabling conditions for effective adaptation—The promotion of adaptation enabling conditions including political commitment and follow-through, institutional frameworks, policies and instruments with clear goals and priorities, enhanced knowledge on impacts and solutions, mobilization of and access to adequate financial resources, monitoring and evaluation, and inclusive governance processes can lead to more effective and equitable adaptation outcomes.

3.2 Focus on synergies and co-benefits—Investments in effective adaptation can be expected to reduce risks and damages as well as generate multiple benefits including improved productivity, innovation, health and wellbeing, food security and biodiversity conservation.

3.3. Develop monitoring and evaluation capacity—Monitoring and evaluation (M&E) of adaptation are critical for tracking progress and enabling effective adaptation. Although most of the monitoring of adaptation is focused towards planning and implementation, the monitoring of outcomes is critical for tracking the effectiveness and progress of adaptation. M&E facilitates learning on effective adaptation measures, and signals when and where additional action may be needed. M&E systems are most effective when supported by capacities and resources and embedded in enabling governance systems.

3.4 Connect climate adaptation, climate mitigation (reducing GHG emissions) and economic development—Climate adaptation is essential to reduce harm, but if it is to be effective, it must go hand-in-hand with ambitious reductions in greenhouse gas emissions because with increased warming the effectiveness of many adaptation options declines and risks maladaptive responses. These climate adaptation and climate mitigation efforts also can be linked with economic development strategies, together called climate resilient development, and can advance sustainable development.

3.5 Incorporate climate action into the everyday—Incorporating adaptation into departments', agencies', and offices' everyday decision making increases the capacity of cities, rural areas and regions to provide services and adapt to climate change for the wellbeing of all. A key element of this everyday practice is the development and implementation of sector and geography specific climate change relevant metrics, standards and codes.

3.6 Prepare for shocks and stresses and take advantage of them—Unprecedented extreme weather events (e.g., extreme heat wave and precipitation events) and chronic climate risk (e.g., increasingly frequent mean monthly high tide flooding) present challenges often beyond the remit and jurisdiction of federal, state and local agencies. These conditions present catalyzing opportunities for advanced post event government review and coordination of follow-on research, learning, and knowledge generation activities.

3.7 Develop a flexible, adaptive, and diverse portfolio of adaptation strategies—Adaptation in the United States and world will depend largely on the resilience of natural, social and physical infrastructure. Strategies that review and incorporate a range of hard and soft adaptation actions are often most effective, and avoid adaptation lock-in. In cities and settlements, a range of green and blue adaptation strategies are being implemented and now critically assessed. For example, in our cities and elsewhere, trees can provide shade, vegetation can have a cooling effect, green areas can provide drainage and flood water storage and urban agriculture can provide food. Coastal wetlands can protect against coastal erosion and flooding associated with storms and sea level rise.

Ms. CASTOR. Thank you, Dr. Solecki.

Next, Dr. Hansen, you are recognized for 5 minutes to present your testimony.

Dr. HANSEN. Good morning.

Ms. CASTOR. Welcome.

STATEMENT OF DR. LARA J. HANSEN

Dr. HANSEN. Good morning, and thank you, Ms. Castor, Ranking Member Graves, and members of the Select Committee for inviting me to speak on Federal strategies for climate change adaptation.

I have had the honor to visit the Hill to discuss climate change 3 times before. First in 2004, pregnant with my son, I shared hopeful examples of climate change adaptation from around the world and urged action to keep climate change to less than 2 degrees Celsius because adaptation and mitigation are both necessary to solve the climate crisis. Back then, I joked with colleagues that all the practitioners in our field could fit in one elevator. In 2007, I was invited back to testify on the effects of climate change on marine ecosystems. My son was 3 years old. I applauded Congress for penning several bills to reduce greenhouse gas emissions. I repeated the need to keep climate change to less than 2 degrees Celsius and added a request for the creation of a national adaptation policy with an extension agency to provide technical support.

The following year, two colleagues and I founded EcoAdapt, a nonprofit devoted to innovating and supporting implementation of adaptation in the United States, a kind of ad hoc extension agency. In 2019, I was invited back to speak on opportunities for adaptation on our public lands. I again requested that we work to keep climate change to less than 2 degrees Celsius and create a national adaptation plan with an extension agency. By this time, EcoAdapt was running the world's largest online adaptation database, CakeX.org, and the National Adaptation Forum, which had over 1,200 participants that year. The field now had more people than could fit in an elevator but still not big enough to meet the scale of the challenge we faced. By the way, the forum will be in Baltimore this October—I hope that some of you can attend and share the progress that you are making on climate change.

In each of your districts, decisions made every day are vulnerable to climate change. If these decisions are not evaluated through a climate lens, we will end up with a failed infrastructure, risking lives and livelihoods, damaging our environment, and hindering our ability to thrive economically, socially, and ecologically. Simply put, explicit consideration of climate change and our actions today is vital for our lives tomorrow. As lawmakers, you have the power to do something about this.

Based on over 20 years of professional experience in the field of adaptation, I recommend the following. One, create and implement a national adaptation plan that requires the evaluation of climate change impacts on all funding and regulatory decisions. Two, create a national adaptation mitigation extension agency to provide technical support to public and private parties at the Federal, state, and local levels, be it a national climate service or an effort being developed by NOAA called the Climate Smart Communities Initiative. Whatever its name, it should be sufficiently funded to co-

ordinate and leverage existing public and private adaptation tools and resources to build capacity and deliver climate information to user communities.

Three, require that Congress and all Federal agencies undertake their mission with an awareness that the climate is changing. This means agencies entrusted to protect our people and resources must evaluate climate change vulnerability such that they can act to reduce climate risk. That should be how we do business. We must ensure that the most vulnerable communities and individuals are given additional attention to ensure our country does not have climate winners and losers. We all have the right to be protected from the harms of climate change, regardless of our race, gender, or economic status. We must recognize the interconnectedness of systems. Cities cannot exist without water, energy, and food, which comes from the natural systems that surround them. This requires holistic plans that include protecting adequate and appropriate space for ecosystems to function under changing conditions. We must ensure that agency and congressional staff have the training to understand climate change when doing their jobs. Without that, we cannot expect our Federal Government to take effective action.

Four, reevaluate acceptable levels of non-climate stresses. The effects of pollutants and other environmental and community stresses can be compounded by climate change. We need to ensure that regulatory and planning responses take that into account so that we can achieve our desired goals to protect the health of people and the environment. And, of course, since my child is now a teenager, I often know that I need to repeat myself to get action, such as, "Please empty the dish rack," so here it goes. Five, please keep global climate change to well below 2 degrees Celsius. Actually, we now know that 1.5 degrees Celsius is a more prudent target. We need to reduce our consumption of fossil fuels to stop making the problem worse. The cost of inaction is unaffordable for us and our children.

My son is now a high school junior making plans for college and a career path. He says he is interested in climate science for his future and that of all of our children. I cannot properly articulate the hope that I entrust in this Congress and this committee. Please take action to increase our likelihood of good outcomes. This and every future generation is depending upon you. I hope that my son is not on the Hill in 10 years with the same list of requests. Thank you.

[The statement of Dr. Hansen follows:]

Testimony for the House Select Committee on the Climate Crisis
on
Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience

March 9, 2022

Dr. Lara J. Hansen
Chief Scientist and Executive Director
EcoAdapt

Planning for and responding to the effects of climate change are essential to our nation, and the world's, long-term stability and sustainability. The recent *Intergovernmental Panel on Climate Change Sixth Assessment Report Working Group 2 Climate Change 2022: Impacts Adaptation and Vulnerability*[1] is not the first we are hearing about the current, promised and potential impacts of climate change on our communities and the ecosystems that surround and support us. For decades we have turned a blind eye to the scientific literature and first-hand accounts of the need to take action on climate change as the harm grows and the risk increase for those communities and ecosystems. In my testimony I will introduce you to the ways we can increase the resilience of our nation to the damaging effects of climate change and what is needed to make this happen.

I would like to begin by providing some context. I am the head of a small non-profit organization that is filling a very large gap—creating a climate-savvy society by innovating, facilitating and training practitioners in adaptation solutions. EcoAdapt's[2] sole focus is to "meet the challenges of climate change." That means helping everyone from foresters and marine protected area managers to city planners and public health officials apply a climate lens through which to evaluate their work and develop solutions that will allow success in meeting their mandate even as the world is changing around us. We do this through four programs. Our **State of Adaptation** program takes a research approach to assessing what activities people are undertaking, what is working and what is preventing success. Our **Climate Adaptation Knowledge Exchange**[3] is the largest adaptation resource database. It is available via an online, open access portal (CAKEx.org) that is accessed by thousands of people from around the world each month. **Awareness to Action** is our workshop methodology that has provided hands-on training in climate change adaptation to over 6,000 individuals representing hundreds of organizations and agencies across the country (and a few around the world). Finally, our **National Adaptation Forum**[4] is a biennial convening of adaptation professionals that affords the opportunity for the exchange of ideas and the innovation of the next generation of climate solutions. The next Forum will be held in Baltimore this October. I hope you can join us.

In the past two decades, I have learned a lot about good adaptation practice—on the ground and through government support. I'd like to share some of that with you today. My hope is that you will see the importance of championing this type of work in your own Districts and through the federal mechanisms that can help to make all of our lands and communities climate savvy. The effects of climate change that are being felt today will continue and intensify for decades and centuries to come, yet every day we are afforded the opportunity to make management and planning decisions that either help us prepare for these changes or leave us more and more vulnerable. I urge you to lead us onto a path toward a better future. A path on which we take both mitigation (reducing the greenhouse gases that cause climate change) and adaptation (preparing for and responding to the climate change impacts that are unavoidable due to past emissions) seriously. These are not choices to be played against each other—both are necessary responses to climate change. Doing one without the other will lead us to our own peril.

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[1] IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press. https://www.ipcc.ch/report/ar6/wg2/

[2] EcoAdapt: http://ecoadapt.org/

[3] Climate Adaptation Knowledge Exchange: https://www.cakex.org/

[4] National Adaptation Forum: https://www.nationaladaptationforum.org/

Ignoring climate change is not an option. It was not an option the first time I testified before a Congressional committee (Senate Committee on Commerce, Science and Transportation) in March of 2004, almost exactly 18 years ago, when atmospheric CO_2 was 378 ppm and global temperature had increased 0.6 degrees Celsius. Yet we did not take action. It was not an option when I testified in 2007 to the Senate Committee on Commerce, Science and Transportation's Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard, when atmospheric CO_2 was 386 ppm. And still we did not change our trajectory. It was not an option when I testified in 2019 and atmospheric CO_2 was 410 ppm and global temperature has risen one degree Celsius. And it is still not an option today when atmospheric CO_2 has reached 418 ppm and global temperatures have risen 1.1 degrees Celsius. I am back today hoping that we are ready to fully address this unprecedented problem with the level of action it requires. The best place to start is somewhere, so let's see what we can do today.

How can we create a durable nation in the face of climate change?

There are clear actions we can be taking to increase our national resilience. To understand why they are needed we can look to how the impacts we are already experiencing and are projected to experience are affecting communities and resources across the country. In this same hearing there will be two speakers from the Gulf Coast, so I will share examples from other regions of the country—not only the impacts that are being felt, but some responses to those impacts.

Fire. Perhaps the most far-reaching effects of climate change have been those of wildfire. Not only have the size, heat and speed of these fires been terrifying, and the damage to life, property, economies and ecosystems been felt deeply where fires occur, but the smoke is having impact at the continental and often global scale. In summer 2020 a colleague and I were collaborating on a project—me on Bainbridge Island in Washington, him in rural Maine—yet we were both inside our houses with windows closed and air filters running to reduce the effects of the smoke-filled air that surrounded our homes. Over the past several years, millions of Americans have experienced these impacts for often weeks at a time—risking serious health impacts with extended outdoor smoke exposure. Many communities are developing plans for how to ensure healthy air in schools when late summer fire season and back to school intersect. Many schools have not historically had air conditioning systems but such equipment is now becoming necessary as windows cannot be left open to cool classrooms on hot late summer days. Obviously adding air conditioning and air filtration systems to schools costs money, as does powering and maintaining them. Money that most school districts, especially those already underfunded, do not have. Additionally, how do we ensure the energy used to power these cooling and air filtration systems does not result in emissions that further compound the problems these actions are working to ameliorate?

Those hot late summer days are also becoming more common as the number of days above 95 degrees Fahrenheit is increasing, meaning more of them occur beyond what is traditionally thought of as peak summer. **Heat** is often described as the invisible aspect of climate change and may be among its most deadly with more constant stress to people and ecosystems then episodic events such as storms or floods. In our daily lives, hearing that global temperatures have increased a bit over 1.1 degrees Celsius does not sound like much. Difference in temperature from day to night is often much more than that. However, that's not what this increase is all about. This is the global average temperature. That means the temperature that makes life possible on our planet. Even small increases in global temperature dramatically change the way our earth systems work. An increase in temperature of 1 degree Celsius can cause coral reefs to bleach, glaciers and ice shelves to melt, ocean currents to change, and evapotranspiration to change. This affects things as basic as our food and water supply. Dealing with heat is an opportunity for knowledge exchange, with examples from warmer climates being of great use to those in warming locations.

Drought. Much of the country has seen long-term or new seasonal drought over the past two decades. From Atlanta to Seattle, the Great Lakes to Los Angeles, there have been droughts that have upended local planning. These have implications of delivery of drinking water, meeting agricultural needs and supporting ecosystems—with lake levels and soil moisture dropping. Communities are taking action to increase water efficiency in building code, encouraging drought tolerant landscaping to reduce the need for irrigation, and increasing local storage capacity. In agriculture, crops are changing, and in forestry, new tolerant species are being planted for restoration and harvest. To make these modifications effective, local planners need information, such as what drought projections looks like more than one year out, and what species will be most appropriate for landscaping and restora-

tion efforts when combining multiple future climate impacts (temperature, drought, seasonal flooding).

Sea level rise and inland flooding. While discussed by other speakers at this hearing, these are not just issues of the Gulf Coast of the United States. Increasing frequency and magnitude of flooding have been seen around the country in recent years as changing precipitation patterns overwhelm often channelized freshwater systems. Sea level rise is being felt as direct encroachment of water, saltwater intrusion to aquifers, and increasing rates of erosion along all coastlines. Sea level rise is a train wreck in slow motion. Why do we continue to develop our coastlines when we know the projections of sea level rise will be a meter or more in many places? On the island where I live, just like most communities across the country, we have not changed our zoning to recognize the reality of climate change and new structures continue to be constructed in harm's way by public and private interests. Federal dollars allocated for local transportation, water treatment and any other activity are not required to consider the impacts of climate change before they are distributed, creating countless bad investments.

Ocean Acidification. While we can't see it, ocean acidification is another aspect of climate change that is complicating our lives. The damage done to ecosystems and fisheries by changing ocean pH will have knock on effects to society. Ocean acidification is expected to diminish coral reef growth, systems already being adversely affected by increasing ocean temperatures. This combination will diminish reefs further reducing the protection they provide to coastlines in Florida and Hawaii, as well as U.S. territories and associated states. Ocean acidification will affect fisheries, including many that are important to tribal, indigenous and other subsistence cultures. There is also the potential for ocean acidification to affect coastal water quality in a manner that will complicate our ability to meet desired standards associated with wastewater treatment and contaminated site remediation. While we need better information about what works as effective adaptation in all sectors, ocean acidification is an area where much exploration, innovation and evaluation are needed.

Interactive effects. Climate change is not occurring in a vacuum. Rather it is another suite of stressors on top of an array of stressors already affecting our people, communities, industries and ecosystems. As a result it will exacerbate the impacts of those stressors, and often also be exacerbated by those stressors. An example of such a multiple stress that was mentioned above is contaminated lands, such as brownfield sites, which when flooded (due to freshwater flooding or sea level rise) can lead to remobilization of contaminants or damage to remediation efforts.[5] Invasive species can also interact with climate change. Similarly, invasive grasses, for example, alter the availability and continuity of fire fuels, contributing to more severe wildfires. There are resilience opportunities in taking action to substantially reduce the presence of these other stressors (e.g., cleaning-up contaminated sites, removing invasive species) in order to decrease the potential adverse impacts of climate change, but only if these actions are taken at a level that genuinely reduces the harm caused when climate change is added.[6]

It is also essential to understand that climate change affects us all, but some people and places will be more deeply impacted than others based on where they are and the resources available to them. In fact for these people the disproportionate burden of other stressors will make the impact of climate change even more devastating. There is great opportunity for federal action to ensure that the needed resources are readily available and that potential harm is limited to the degree possible.

Planning for the future, not the past. Those who work in climate change often point out what may sound obvious—the past is not an option. However when you realize that most planning and management decisions are made based on past patterns of development, economic trends and local preferences, you also realize that we are rarely planning for the future. A simple example of this can be seen in natural resource management where a vital tool for habitat protection is habitat restoration. The very premise of restoration is to restore the site with the flora and fauna that previously inhabited the location prior to some injury (e.g., fire, oil spill). Yet in many cases the species that used to live there will no longer find it hospitable given changes in temperature and precipitation patterns, or sea level rise. Similarly

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[5] Mielbrecht, E. and K. Tarrio. 2019. Massachusetts Climate Change & Hazardous Waste Site Screening. EcoAdapt.,
https://www.cakex.org/sites/default/files/documents/
MA%20Climate%20%26%20Contaminants%20Screening%20Report%20FINAL%206Dec2019.pdf

[6] Hansen, L.J. and J.R. Hoffman. 2011. Climate Savvy: Adapting Conservation and Resource Management to a Changing World. Island Press, Washington DC.

designing stormwater infrastructure for past run-off levels in areas likely to see dramatic increases in large precipitation events would not be a prudent investment. An example of progress in this area was the course correction by FEMA to no longer require rebuilding damaged structures just as they had been which would have made them just as vulnerable as they were, increasing the likelihood of repeated damage.

The need for regional coordination. Improving coordination helps increase the resilience of people and landscapes by providing opportunities for leveraging resources (e.g., funding, data, people time), building buy-in and support for plans and on-the-ground projects, improving communication about planned and ongoing activities, and providing a shared understanding of threats, solutions, and priorities. For example, the Flagstaff Watershed Protection Project is a partnership effort between the State of Arizona, City of Flagstaff, and Coconino National Forest to help reduce the risk of devastating wildfire and post-fire flooding in neighboring watersheds.[7] In 2010, the Schultz Fire in Coconino National Forest severely burned thousands of acres of steep terrain; over 20 major flash flooding events occurred after the fire, destroying community drinking water sources and costing over $130 million in damages. Increased fire severity and extreme precipitation events are projected to continue with climate change, requiring targeted forest restoration work and collaboration to reduce the risk of fire and flooding and subsequent impacts on the community. This project is one of only a handful of examples where restoration work on a national forest is being funded primarily by a municipality.

In coastal systems, sea level rise is causing saltwater intrusion into freshwater ecosystems and aquifers resulting in habitat conversion, infrastructure loss, and in some cases, forced relocation of coastal communities, such as in Alaska (e.g., Native Alaska Villages of Kivalina and Newtok) and Washington State (e.g., Hoh Tribe). The primary adaptation approaches employed to address sea level rise, flooding, and erosion issues include: engineered structures (rip rap, bulkheads, tide gates), natural and nature-based approaches (natural habitats such as wetlands or engineered natural features such as living shorelines), and policy and regulatory techniques (tools that either prevent infrastructure in at-risk areas, such as conservation easements, managed retreat; or modify how activities are implemented to reduce risk such as rolling easements, minimum development buffers, real estate disclosures).[8] Natural and nature-based approaches are increasingly used in the United States, especially in lieu of structural approaches that are experiencing limited and declining use, largely due to their cost, lifetime, and the potential for negative ecological consequences. New and novel approaches, including prioritizing, protecting and restoring coastal wetlands with room to migrate inland as sea levels rise, as well as purchasing the land to create new opportunities for coastal habitat migration, are also important.

What do we need to make adaptation possible for all?

Adaptation is necessary not only for our cities, counties and states, but it is also needed for the management and protection of the natural systems upon which we rely. Our rivers, lakes, aquifers, oceans, estuaries, forests, grasslands, deserts and even our agricultural lands give us clean water, raw materials, clean air, and food, as well as also being home to our nation's biodiversity of which we are the stewards. We cannot protect our communities from the impacts of climate change if we are not protecting the very resources we rely upon.

As I was sharing examples of the impacts and actions above, I was outlining the categories of actions that are needed to make adaptation happen. These include:

1) Capacity building
2) Mandate
3) Access to data
4) Access to funding
5) Assessing adaptation effectiveness
6) Ways to share adaptation knowledge
7) Holistic action

Capacity building: While climate change is a ubiquitous challenge to every facet of our lives, society and nature, most people have no idea how it affects their ability to do their jobs or how to make decisions in a climate savvy manner. This will re-

[7] Flagstaff Watershed Protection Project: http://flagstaffwatershedprotection.org

[8] Gregg R.M., W. Reynier, L.J. Gaines, and J. Behan. 2018. Available Science Assessment Process: Sea Level Rise in the Pacific Northwest and Northern California. Report to the Northwest Climate Adaptation Science Center. EcoAdapt (Bainbridge Island, WA) and the Institute for Natural Resources (Corvallis, OR).

quire basic applied education that reaches broadly, as well as in depth educational modification for how everyone from engineers to game wardens to factory supply managers apply adaptation in their trade. Not to be left out of this educational need is congressional and agency staff in our state and federal governments. We need to make consideration of climate change as common place as consideration of funding or staffing. To do this we need to actively provide training across the country. Perhaps akin to public health or emergency preparedness campaigns wherein general awareness as well as local technical expertise are both strengthened. A **National Climate Service**, which could be created from many existing pieces both within and outside of the federal government, is desperately needed. One the greatest resources we have to address climate change is the collective capacity of scientists, planners and managers in our federal, tribal, and state agencies and nongovernmental institutions. The knowledge, experience, and ingenuity brought by our federal partners cannot be undervalued as a key part of the solution to climate change. To capitalize on this asset, we need increased capacity, coordination, and collaboration among and between federal agencies and their non-federal partners, including tribal nations, nonprofits, businesses, community groups, and academic institutions.

Mandate: Everyday decisions are made that are vulnerable to climate change when there are virtually no requirements to consider climate change. Federal dollars are spent to build new infrastructure but there is no climate lens to ensure these projects can endure for their projected lifetime without succumbing to damage from climate change. For example, development in flood plains, ill-suited for extreme weather events, on eroding coastlines, reliant on aquifers which are being infiltrated by rising seas, in areas prone to wildfires and mega-droughts should be disincentivized. In our State of Adaptation Program interviews, we have found that leading motivations of adaptation action are clear mandates, laws and policies. Therefore it would be advised to create a mandate requiring the avoidance or reduction of climate change vulnerabilities in any and all federal funding mechanisms. These mandates and policies should require agencies to work across jurisdictions to increase the likelihood of success. An essential requirement will be to incorporate climate change into all governmental or governmentally-funded planning efforts. This can take the form of discrete "climate action or adaptation plans" or the direct integration of climate change into existing planning processes. For example, EcoAdapt, in collaboration with numerous other partners, worked with the Greater Farallones National Marine Sanctuary (located along the north-central California coast and ocean) to evaluate vulnerability of their species, habitats, and ecosystem services to climate change and create a Climate Adaptation Plan.[1] The region's natural resources and the services they provide are vulnerable to increasing ocean temperatures, sea level rise, and extreme weather events (winds, waves, storms). The plan integrates climate adaptation into existing management frameworks and recommends over 75 adaptation strategies for regional management agencies to take to enhance coastal resilience, including implementing living shorelines, protecting and restoring habitat, limiting human disturbance, addressing invasive species, promoting education, and investing in science needs.

Access to data: Good decisions can be made when good data are available. Fortunately, good data for climate change exist. We must ensure that these data are accessible, understandable, applicable and used by everyone. Great strides have been made to ensure ease of access. Tools such as Climate Explorer,[9] Sea Level Rise Viewer,[10] CoralReef Watch[11] all make data easily accessible to and for any interested user. There are still often gaps that prevent users from knowing these data exist or how to apply them. These gaps could be addressed with improved capacity (as described above), data tools to cover more issues (e.g., drought, wildfire, interactive impacts such as contaminant remobilization), and more centralized access points to the full range of data and tools available for making climate savvy decisions. Currently each federal agency has their own lists of tools and data, often not easily navigated by users. Interfaces such as the Climate Resilience Toolkit,[12] ARC–X,[13] and the Climate Adaptation Knowledge Exchange[14] all are a great start but are all wildly underfunded to meet the need and not broadly discoverable. Of course the ability of these interfaces to deliver good data is incumbent on our continued commitment to data—monitoring the effects of climate change (in the field and re-

[9] Climate Explorer: https://crt-climate-explorer.nemac.org/
[10] NOAA Sea Level Rise Viewer: https://coast.noaa.gov/digitalcoast/tools/slr.html
[11] NOAA Coral Reef Watch: https://coralreefwatch.noaa.gov/
[12] Climate Resilience Toolkit: https://toolkit.climate.gov/
[13] Environmental Protection Agency Climate Change Adaptation Resource Center: https://www.epa.gov/arc-x
[14] Climate Adaptation Knowledge Exchange: https://www.cakex.org/

motely from space), updating and maintaining state-of-the-science models and projections, and interpreting these data for the broad array of uses that required them.

Access to funding: There is no avoiding it, climate change will cost us money. And inaction will only cost us more. Making funding available for climate action (mitigation and adaptation) is insurance to prevent more costly expenses due to damage in the future. It should also be noted that by requiring a climate lens to evaluate the comparative vulnerability of different actions (e.g., where to site a road to avoid flooding, how to build houses to reduce energy costs in a warming world, when to undertake habitat restoration projects to avoid extreme weather damage, who to include in planning processes to ensure all vulnerabilities are identified, what land use practices can best reduce wildfire hazards for people and wildlands) we can ensure that all tax dollars spent are adaptation dollars. This will avoid funds being spent for no long-term gain, while increasing benefit through avoided climate change impacts and cost saving when fewer subsequent expenditures are needed to correct for short-sighted misallocations.

Adaptation is a multi-phased process that includes scientific assessments, planning, implementation, and monitoring and evaluation. Funding directed to just one of these phases will not deliver the results needed to comprehensively address climate change. Therefore, it is imperative that the federal government increase its capacity to provide sustained funding to all stages of the adaptation process, particularly to implementation where upfront costs tend to be higher. Emphasis must also focus on increasing the capacity of state and local governments, as well as boundary organizations, such as nongovernmental partners, to execute climate adaptation work. These organizations are sources of highly specialized and locally relevant expertise, and execute on-the-ground work from technical decision support to facilitating community discourse through workshops. Additional funding sources include foundations and local and state governments. However, many of these initiatives have resulted in piecemeal, fragmented, and disparate approaches, as well as a lack of movement beyond assessment and planning. Federal finance plays a key role in funding all phases of the climate adaptation process. In fact federal funding that is used to support projects that are not inherently taking climate change into account is likely to be money misspent—unable to create the benefits it was intended to achieve when the effects of climate change erode the target efforts.

Assessing adaptation effectiveness: It is clear that inaction is no longer an option, which makes it even more essential that we know which actions will offer the greatest likelihood for positive outcomes. With limited money, staff, resources and time, the more we can learn about what works the better. To do this we need to actively monitor the effectiveness of the implementation of processes, tools and actions to decrease our national vulnerability. This means being willing to learn what doesn't work as well as what does. It requires providing funds to not only create data infrastructure, train the workforce and implement the adaptation actions, but also to track and test each of those steps to ensure they are delivering on their promise. There is often an assumption that with climate change adaptation we will not know what is working until decades from now. While there certainly will be greater clarity on the effectiveness of our actions in the future, we are not without methods to learn early and modify in the short-term to increase our chances for success in the long-term. We need a national database that monitors and tracks adaptation efforts, with researchers dedicated to analyzing the findings to inform our next iterations of what is good adaptation.

The importance of making informed decisions to alleviate the environmental, social, financial, and emotional costs of climate change cannot be overstated. Climate change presents a variety of impacts to which we must respond. Several adaptation case studies and guidebooks have been released in recent years with recommendations of suitable adaptation actions to address different climate impact concerns. However, determining when, where and how a particular action may be best implemented is more difficult to discern. Synthesizing what has worked and what has not worked, as well as why, can help identify potential modifications to current practices and facilitate understanding of the consequences of decisions. Further, science- and evidence-based decision-making supports better outcomes, while reducing costs and lowering the risk of implementing policies that may be based on well-intentioned but insufficient research. In addition to improving overall practice, a better understanding of which actions can be most effectively applied in different settings helps identify and leverage funding opportunities and create new or enhance existing partnerships to advance climate adaptation. EcoAdapt has embarked on an effort to evaluate the body of scientific knowledge supporting specific climate adaptation actions to determine the conditions under which particular actions may be most effective for achieving management goals. Since 2014, we have assessed wildfire, sea

level rise, and drought adaptation options. This work needs to expand beyond these three topics, not to mention being better funded.

Sharing adaptation knowledge: Learning from the past and ongoing efforts of others, as well as from research is fundamental to ensuring effective, successful adaptation outcomes can happen in a timely manner. Federal (Climate Resilience Toolkit)[15] and nongovernmental (EcoAdapt, Climate Adaptation Knowledge Exchange,[16] Georgetown Adaptation Clearinghouse)[17] knowledge brokers play central roles in gathering, synthesizing, and contextualizing science into digestible and actionable information sources. Since 2009, EcoAdapt has engaged in a sustained research initiative to identify, evaluate, and assess climate adaptation activities in planning and underway. This includes identification and synthesis of best available science on historic, observed, and projected future climatic changes and impacts, extensive reviews of federal, tribal, state, and local climate change planning documents, over 4,000 interviews with practitioners in order to identify trends and barriers to climate adaptation action, and over 400 case studies now housed on the Climate Adaptation Knowledge Exchange. As with other aspects of climate data, we need to improve access and discoverability of these repositories and their holdings.

Holistic action. Woven through all of the above must be approaches that think holistically and act equitably. Climate change affects everyone everywhere, but the impacts are not felt equally. The ability of historically disenfranchised and underserved communities to adapt to climate change will be stymied by underperforming infrastructure, underfunded institutions, absent services, fewer safety nets such as insurance, and numerous other existing stressors that will be exacerbated by or exacerbate climate change. At the same time, protecting our public lands is a critical part of an adaptation strategy that not only safeguards these areas and the ecosystems that inhabit them, but also the ecosystem services upon which our citizens rely. Investment in the protection of public lands may be our best path to enduring access to clean air, clean and plentiful water, flood control, wildlife habitat, improved mental health, spiritual heritage, and recreational enjoyment. Finally, collaboration across jurisdiction and between sectors will help avoid solutions that work at cross-purposes while maximizing efficiency of limited resources. All of abovementioned elements could be part of a **National Adaptation Plan** or a **National Climate Strategy**. Completed under the auspices of a coordinated approach there is certainly a greater likelihood for success in ensuring the many facets of society and ecosystems are supported, that resources are applied equitably, that training is consistent, goals can be established, and progress can be tracked. Currently climate change adaptation is unfunded, uncoordinated and largely wishful thinking. Without clear adaptation goals and the tools to achieve them we cannot expect good long-term outcomes for our country or our planet.

To meet the needs of your constituents, we need Congress to become well-versed in understanding the full range of issues inherent in effective adaptation, to fund adaptation, to require adaptation within all federal action, and to ensure that the enabling conditions required for adaptation to happen are in place (e.g., data collection and dissemination, training, removing barriers to local action, research). This can be undertaken in a piecemeal approach but to meet the challenge of climate change with the timeliness that is required, a better approach would be a coordinated federal approach funded and staffed at the scale befitting the consequences for everyone in every one of your districts.

Concluding Thoughts

The problems presented by climate change are vast and the solutions are innumerable and long overdue. With a challenge as urgent and pervasive as climate change, any delay in action is harmful. We have been underachieving for decades. Further prevention of progress will result in backsliding with irreversible and in some cases deadly consequences. What we need is for leadership to step forward. This Congress has the ability to right the ship and advance climate action like never before—at a rate appropriate for the scale and speed of this problem. Key items for prioritization include:

- Increase investments in science- and evidence-based approaches to climate adaptation while allowing for flexibility to identify, develop, and test promising, novel approaches. This includes not just funding for modeling and data collection, but also increased funding for implementation of adaptation actions which include evaluation of effectiveness, and capturing and sharing those lessons learned.

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[15] Climate Resilience Toolkit: https://toolkit.climate.gov/

[16] Climate Adaptation Knowledge Exchange: http://www.CAKEx.org

[17] Georgetown Adaptation Clearinghouse: https://www.adaptationclearinghouse.org/

- Increase coordination and collaboration between federal entities and non-federal partners (including international partners) to advance climate adaptation objectives. For example, the majority of federal dollars goes towards fire suppression rather than prevention activities. Getting fire back onto the landscape (both natural and prescribed burns) to support ecological functions is critical, especially as a means to reduce wildfire risk. This includes supporting tribal cultural burning practices across the landscape.
- Reduce the rate and extent of climate change by reducing our reliance on fossil fuels that are polluting our air and water, damaging habitat, harming our health, decreasing our national security, preventing our development into growing job sectors and causing climate change, which is threatening our survival.

Congress' power to appropriate funds can be wielded as one of the most effective tools to ensure the prioritization of climate adaptation overall.[18] Appropriations should be viewed through a climate lens to ensure that the agencies, departments, and research programs most qualified and poised to meet the climate challenge are adequately funded, and that any investments of tax payer dollars are not mis-spent on efforts that are likely to be undermined by the effects of climate change. We need simultaneous action at the scale required to solve the problem on climate change mitigation and adaptation. Approaches like the recent Infrastructure Bill and Build Back Better present the types of opportunities we need to seize to take action at a sufficient scale to integrate investments in climate adaptation across all agencies to address the effects of climate change we are and will experience due to the past emissions we did not curb.

I invite the current Congress to have the fortitude your predecessors have lacked. The time to take meaningful action on climate change to protect our nation and our neighbors around the planet is upon us. It is your job as elected officials to recognize the scope of this crisis and make the changes that are needed. Be brave. Be bold. Take action today for a better tomorrow for all.

Ms. CASTOR. Thank you, Dr. Hansen.

Next, Mr. Jewell, you are recognized for 5 minutes. Welcome.

STATEMENT OF THE HONORABLE MATTHEW JEWELL

Mr. JEWELL. Good morning. Ms. Castor, Ranking Member Graves, members of the committee, thank you for allowing me to appear in front of you today. My name is Matthew Jewell, and I am the President of St. Charles Parish, Louisiana.

Southeast Louisiana is an incredible place to live. Its natural beauty, rich resources, and the economic engine that is the Mississippi River provide the foundation of our $87 billion economy. However, what truly makes Louisiana incredible is our people. Louisianans are some of the most resilient people you will ever meet. For centuries, they have called Louisiana home, and they have stood steadfast as they have faced hurricanes, land loss, and now a global pandemic. Through it all, Louisianians continue to rebuild, adapt, and overcome despite the challenges.

Southeast Louisiana's economy accounts for about 36 percent of the state's total GDP. Last year, we exported $105 billion of goods and services from the region. The state ranks 3rd in the U.S. in natural gas production, and it has 20 percent of the nation's oil refining capacity. In St. Charles Parish alone, we have 14 industrial sites ranging from oil and gas, chemical, and even a nuclear power plant which produces 1.1 gigawatts of carbon free electricity, which is enough to power over 750,000 homes.

Most recently, Louisiana was devastated by Hurricane Ida, a strong Category 4 hurricane. Our communities came together with our industry partners. We picked up the pieces, and we are getting

[18] For an additional list of opportunities to promote adaptation through Congressional action, see the Climate Policy Menu: http://climatepolicymenu.org/adapt/

back to work. This is what we do. Nevertheless, it is getting more difficult to be resilient due to policies coming out of Washington, D.C. Bureaucratic hurdles have made it increasingly difficult and costly to construct flood protection and coastal restoration projects. Additionally, new policies around FEMA's Flood Insurance Program have begun to put an economic constraint on people living in the region. To reverse these impacts, we must begin by cutting the red tape on coastal restoration projects designed to restore our wetlands to their natural state, and time is of the essence.

Since the 1930s, Louisiana has lost more than 2,000 square miles of land, an area roughly the size of Delaware. To solve this, we need an all-of-the-above approach to coastal restoration, which involves dredging, marsh restoration, shoreline protection, and, where they work, freshwater and sediment diversions to restore the natural process which created the land where we live. Passing legislation, such as the bipartisan SHORE Act, will allow places like Louisiana to continue to advance critical storm protection and coastal restoration priorities for our vulnerable communities and habitats. The SHORE Act puts into law that the U.S. Army Corps of Engineers shall prioritize coastal restoration and eliminate the legal and regulatory hurdles that have caused delays in implementing these types of projects. Raising or eliminating the cap on GOMESA revenues would provide the funding needed to make these projects a reality as it is currently the state's only consistent funding source for the coastal program. As we discuss resiliency, we must also consider economic resilience.

FEMA's Risk Rating 2.0 puts an unbearable financial burden on homeowners. Under FEMA's new risk rating policy, we have seen new home policies that were traditionally as low as $600 jump upwards of $8,500. These increases, coupled with the highest inflation our nation has seen since 1982, is not economically sustainable. We need more investment in flood protection to mitigate risks, not policies that are going to force Americans to abandon their homes. Federal investment in projects like the Upper Barataria Risk Reduction System will protect hundreds of thousands of people, property, and billions of dollars of infrastructure vital to our national economy. The Corps of Engineers chief's report says the benefits produced by this project are cost-effective. However, on the other hand, FEMA's flood insurance policies threaten to force people out of the area. We have seen flood protection projects like these work firsthand. I agree with the Section SPM.C.2.1 of the most recent IPCC report which indicates that, "Structural measures, like levees, have reduced the loss of lives," and that "enhancing natural water retention, such as by restoring wetlands and rivers, can reduce flood risk."

In closing, Southeast Louisiana is a critical part of our national economy. Together, local, State, and Federal governments can work to ensure we focus on making changes that will complement the resilient people of Louisiana. I thank you for your time, and I look forward to answering your questions.

[The statement of Mr. Jewell follows:]

Testimony by
Matthew Jewell
St. Charles Parish President
To the U.S. Congress and Select Committee on Climate Crisis
Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience
Wednesday, March 9, 2022

Good morning.

Chairwoman Castor, Ranking Member Graves, members of the Committee, thank you for allowing me to appear in front of you today.

My name is Matthew Jewell, and I am the President of St. Charles Parish, Louisiana.

South East Louisiana is an incredible place to live. Its natural beauty, rich resources, and the economic engine that is the Mississippi River provide the foundation of our $87 billion economy. However, what truly makes Louisiana incredible is her people.

Louisianians are the most resilient people you will meet. For centuries they have called this place home and have stood steadfast as they have faced hurricanes, land loss, and now a global pandemic. Through it all, Louisianians continue to rebuild, adapt, and overcome despite those challenges.

LOUISIANA ECONOMIC IMPACT

South East Louisiana's Economy accounts for about 36% of the States total GDP. Last year we exported over $105 billion of goods and services from the region. The state ranks 3rd in the country for natural gas production and 20% of the national oil refining capacity. In St. Charles Parish alone, we have 14 industrial sites, ranging from oil and gas, chemical and even a nuclear power plant which produces 1.1 gigawatts of carbon-free electricity, enough to power over 750,000 homes. Additionally, St. Charles Parish is home to Diamond Green Diesel, the largest renewable diesel plant in North America and the second-largest in the world. The fuel produced at this facility reduces greenhouse gas emissions by up to 80% as compared to traditional diesel fuel.

The region also benefits from the Port of South Lousiana, which is the second largest port in the country by total tonnage and largest port complex in the western hemisphere. Additionally the benefit of muti-modal trasporation including all six class one railroads, multiple interstate highways, and an international airport creates additional competitive opportunities for this region.

RESILENCE

Lousiana is no stranger to hurricanes and tropical storms. Most recently, Louisiana was devastated by Hurricane Ida, a strong category four hurricane. Ida was the strongest storm to impact St. Charles Parish and caused significant damage to four parishes leaving thousands of residents without safe drinking water and power for weeks.

Days following the storm, St. Charles Parish was still flood fighting in low-lying areas like Bayou Des Allemands where we worked with the National Guard to prevent water from breaching the current levee. Securing resources, including fuel, was challenging yet essential to keeping vital services like our emergency operations center and our water and sewer systems operational. Our communities came together with our industry partners, picked up the pieces, and got back to work.

Nevertheless, it is getting more difficult to be resilient due to policies coming out of Washington, D.C.

Bureaucratic hurdles have made it increasingly difficult and costly to construct flood protection and coastal restoration projects. Additionally, new policies around FEMA's flood insurance program have begun to put an economic constraint on people living in this region.

To reverse these impacts, we must begin by cutting the red tape on coastal restoration projects designed to restore our wetlands to their natural state, and time is of the essence. Since the 1930s, Louisiana has lost more than 2,000 square miles of land, an area roughly the size of Delaware. To solve this, we need an "all the above" approach to coastal restoration which involves dredging/marsh restoration, shoreline protection, and where they work, freshwater and sediment diversions to restore the natural process which created the land where we live.

SHORRE ACT

Passing legislation such as the bi-partisan SHORRE Act will allow places like Louisiana to continue to advance critical storm protection and coastal restoration priorities for our vulnerable communities and habitats. The SHORRE Act puts into law that the U.S. Army Corps of Engineers shall prioritize coastal restoration and eliminate legal and regulatory hurdles that have caused delays in implementing these projects.

The SHORRE Act would also allow the Corps to provide leadership to conduct the Lower Mississippi River Comprehensive Management Study. The study would enable the Corps to use the best available science to manage the river and use holistic approaches to enhance the resilience and sustainability of natural systems.

Additionally, the bill would allow the Corps to work directly with states, localities and other non-Federal sponsors to request project designs that directly address problems such as extreme rainfall and increasing sea level rise.

GOMESA (Gulf of Mexico Energy Security Act)

Raising or eliminating the cap on GOMESA revenues would provide the funding needed to make these projects a reality as it is currently the only consistent funding for the state's coastal program.

The Gulf of Mexico Energy Security Act (GOMESA) of 2006 created a revenue-sharing model for oil- and gas-producing gulf states. Under the act, Alabama, Louisiana, Mississippi, and Texas receive a portion of the revenue generated from oil and gas production offshore in the Gulf of Mexico. The act also directs a portion of revenue to the Land and Water Conservation Fund.

Under GOMESA, Gulf Producing States split 37.5% of qualified OCS Revenues, and the Land and Water Conservation Fund gets 12.5%. The Remaining 50% of GOMESA revenues remain with the federal government.

As it stands, the amount of funding that Louisiana uses to address coastal needs, will not be enough to meet the scale of the challenges our state faces. Making long-overdue improvements to GOMESA is needed.

The RISEE Act would establish several dedicated streams of funding for coastal infrastructure and resiliency in order to protect vulnerable communities and businesses most impacted by rising sea levels and coastal erosion. The legislation creates a new revenue sharing model from federal offshore wind revenue generation between the federal government and coastal states beyond six nautical miles from a state's coastline. The bill makes improvements to the National Oceans and Coastal Security Fund (NOCSF), and also dedicates a portion of wind energy revenues to the NOCSF. Finally, the bill reforms the Gulf of Mexico Energy Security Act (GOMESA) to allow for a greater state share of revenue from Gulf energy production.

RISK RATING 2.0

As we discuss resiliency, we must also consider economic resilience. FEMA's Risk Rating 2.0 puts an unbearable financial burden on homeowners. In 2012, St. Charles Parish was one of the epicenters of the Biggert-Waters Act. Residents received unadfordable policies that threatened to render them bankrupt and their homes worthless. Our community banded together with our Congressional delegation which was able to roll back the law. Now, under FEMA's new risk rating policy, we have seen new home policies that were traditionally as low as $600 jump upwards of $8500. These increases, coupled with the highest inflation our nation has seen since 1982, are not economically sustainable.

According to FEMA's national rate analysis, 80% or more of policies in Louisiana will see increases. The current rates we are seeing are astronomical and will be detrimental to the future development of communities.

Phase 1 of Risk Rating 2.0 began in October 2021 for new policies. New policies affect people who are building or have recently completed a new home construction. These new policy quotes have already caused many residents to cancel new construction plans. Phase 2 will begin in April 2022 and will affect existing policy holders. Policy increases are capped at 18% and will end up at what FEMA has determined is an actuarial rate.

UPPER BARATARIA BASIN RISK REDUCTION SYSTEM

We need more investment in flood protection to mitigate these risks, not policies that will force Americans to abandon their homes. Federal investment in projects like the Upper Barataria Basin Risk Reduction System will protect hundreds of

thousands of people, property, and billions of dollars of infrastructure vital to our national economy. The Corps of Engineer's Chief's report says the benefits produced by this project are cost-effective. However, on the other hand, FEMA's flood insurance policies threaten to price people out of this area.

Last month, Lt. Gen. Spellmon, USACE Commanding General and 55th Chief of Engineers approved the Chief's Report for the Upper Barataria Basin (UBB) Louisiana Feasibility Study, paving the way for the project to move forward.

The multi-year project protects 800 square miles from storm surge for six parishes, including St. Charles Parish. The proposed structural alignment consists of 30 miles of levees spanning from the Davis Diversion to Highway 308 in Lafourche Parish, floodwalls, barge gates and drainage structures.

The Upper Barataria Basin Study received authorization in 1998; however funding was not made available to the project until 2018. The $1.55 billion investment is anticipated to take three years to complete once approved by Congress.

Thanks to the efforts of members of our Lousiaian delegation, Congress signed a $2.5 billion Hurricane Ida relief bill that included $8 million for the preconstruction engineering and design phase on the UBB project, which can begin this year. For the first time ever, a project with a signed Chief's report can begin the engineering process prior to being fully funded by Congress which will expedite the project.

We have seen these systems work firsthand. I agree with section SPM.C.2.1 of the most recent IPCC report, which indicates that "structural measures like levees have reduced loss of lives" and that "enhancing natural water retention such as by restoring wetlands and rivers . . . can further reduce flood risk."

In closing, Southeast Louisiana is a crucial part of our national economy and is worth saving. Together, local, state, and federal governments can work to ensure we focus on making changes that will complement the resilient people of Louisiana. Thank you for your time. I look forward to answering any of your questions.

Ms. CASTOR. Thank you very much. Next, Dr. Augustine, you are recognized for 5 minutes for your testimony. Welcome.

Dr. AUGUSTINE. Is that better? Okay.

STATEMENT OF DR. LAUREN ALEXANDER AUGUSTINE

Dr. AUGUSTINE. Thank you for inviting me to testify today. My name is Lauren Alexander Augustine, and I am the Executive Director of the Gulf Research Program at the National Academies of Sciences, Engineering, and Medicine. The Academies have done much work on climate issues that may be of use to this committee, but today, the views I represent are my own.

So equity, resilience, and adaptation, these are important and pressing issues of our time, and I am going to talk about three things in the 4 minutes and 30 seconds left. I am going to talk about the interconnected pieces that drive resilience, what resilience is and how it works, and the fierce urgency of now.

So the interconnected pieces are the environment, the economy, and the people, just as Mr. Jewell just said. And on the environment, the scientific consensus is unequivocal that climate change is a threat to human wellbeing and planetary health, but we can see some of these changes for ourselves. Just over the past few years, storms have been getting more frequent, more intense, more expensive. The hurricane season in 2020 was the most active in U.S. history. Hurricanes Michael in 2018 and Ida in 2021 are two of the five strongest storms in U.S. history, and now 2017 is the most expensive hurricane season in U.S. history, removing 2005 with Katrina, Rita, and Wilma, and pushing that to second.

So these hurricanes mostly happened in the Gulf of Mexico where oil and gas is an economic powerhouse for the region and the country. And in all of my community resilience work, one thing is true: a healthy economy is foundational for resilience. So in 2019, almost all of the offshore oil and gas in the U.S. came out of the

Gulf of Mexico. More than half of natural gas and about half of the nation's crude oil are produced in that region. Even still, we see Louisiana and Texas planning to greatly reduce their greenhouse emissions and dependence on fossil fuel. In fact, Louisiana just published its first climate action plan last month to achieve net zero greenhouse gas emissions for the entire state economy. As these changes occur, we must ensure that the economic engines remain strong.

And then, there are the people. Climate change is a threat and risk multiplier. This means that they magnify the inequities that already exist in society on race, income, language, mobility, such that those who are disadvantaged, they see their disadvantages compound when disasters strike. There are other vulnerabilities as well. A hundred million people live on the coast on U.S. 60 in the path of hurricanes, and people continue to move to the coasts. So we see these kind of stack up in pricey ways. The five states around the Gulf of Mexico—Texas, Louisiana, Mississippi, Alabama, and Florida—they account for more than 60 percent of the disaster relief funds in the whole country. So if we can find a workable balance in this region, we can find a solution for the country.

So what is resilience? In my view, resilience is like a zipper, and we have heard about the pieces here: the economy, the people, the data. But when all of this is undone, they don't do much good to anybody. It is when they are connected that it turns into something useful, strong, and protective. So the environment, the energy, are like teeth on a zipper, and the top end is like the Federal resources and authorities, but the base of the zipper, the part that gets it all started, it is the local communities. And so the GRP, specifically, in science, kind of more generally, are like the slider and the pull that connects the local communities to the Federal resources and vice versa.

So we did this in November 2021, just a couple months ago. We organized what we called the serious game around Federal investments on infrastructure, for more resilient infrastructure in the Gulf of Mexico. And we brought the local Gulf experts together with Federal representatives to address questions like bang for your buck on Federal investments on infrastructure, and how do we work with Federal funds to make sure private assets don't become public liabilities. It was a really successful event, and we are going to run it again in the Gulf region this spring because we need these examples of effective connections across science, across communities, and across the Federal agencies.

So in my last 30 seconds, let me just talk about this fierce urgency of now. Dr. Solecki and everyone on the panel thus far have talked about this window is closing, but I just want to kind of emphasize that if it is closing, it means it is still at least a little bit open. And so we can act and we can act now, and the future generations are depending on what we do today. They are going to know what we knew, when we knew it, how we chose to act. And we could wait and take no action, or we can start now to ensure equity and resilience for all. We have strong science. We have a once-in-a-generation opportunity of an infusion of resources, and we have a collective motivation to design communities, energy, economies that bend towards resilience for all. We want, in other

words, in 100 years, the people of that time to look back on us today and say that we did the right thing.

I thank you very much for this opportunity to testify.

[The statement of Dr. Augustine follows:]

Dr. Lauren Alexander Augustine

Executive Director, Gulf Research Program, National Academies of Sciences, Engineering, and Medicine

Written Testimony

House Select Committee on the Climate Crisis

09 March 2022

Ms. Castor, Ranking Member Graves, and members of the Select Committee:

Thank you for inviting me to testify today. My name is Lauren Alexander Augustine, and I am the Executive Director of the Gulf Research Program at the National Academies of Sciences, Engineering, and Medicine. The views I express today are my own and not the views of the National Academies as an institution unless otherwise noted.

I appreciate the opportunity to speak about equity, resilience, and adaptation. The Intergovernmental Panel on Climate Change (IPCC) Working Group II Report warns that climate change will impact more people in "grave and mounting" ways. So, the question before all of us is how can we avoid "grave and mounting" outcomes and instead achieve equity and resilience as we adapt to climate change.

There are three main elements to my testimony today that could help reduce the costs of disasters and improve the safety and resilience of the citizenry. First, I will talk about the components of equity and resilience: environment, energy, economy, and people. None of these components are static; and, they interact in ways that impact and are impacted by each other. The second part is about integrating across levels of government to connect communities to the knowledge and resources they need. Finally, there is a fierce urgency of now. We have a rapidly closing window of opportunity in which to reduce our planet-warming emissions and make investments today that will create a more prosperous, healthy, and equitable future for all Americans. Now is a once-in-a-generation opportunity to bend the arc towards equity and resilience.

Elements of Equity and Resilience

An effective and equitable resilience strategy will require managing environmental, economic and demographic risks.

The environment and climate, our economy, and where and how our populations live are basic elements that determine to what extent our communities will be equitable, adaptive, and resilient.

On **environment and climate transitions**: the scientific evidence is unequivocal that climate change is a threat to human well-being and planetary health. The IPCC Working Group II Report on Impacts, Adaptation and Vulnerability is clear and dire in its predictions as to how climate change will be seen and felt. It is the latest in a series of reports from scientific experts and academies around the world about the impacts climate change will bring. We can already see some of these changes. In 2017, the US saw its costliest hurricane season, pushing 2005—the infamous year with Hurricanes Katrina, Rita, and Wilma—to the second most costly; 2021 was the third costliest. In 2017, Hurricanes Harvey, Irma, and Maria and the California wildfires affected 47 million people, some 15% of the US population (Hill, 2021), and those three hurricanes rank in the top 5 costliest hurricanes in the United States history (NOAA, 2022).

Climate change means that we can expect to see a rise in the number of billion-dollar disasters, as well as the likelihood of modest or even smaller events occurring in rapid sequence, the aggregate of which can create more damage, costs, and trauma than a single large event. Compounding and sequential disasters will look like the 2020 hurricane season, the most active Atlantic hurricane season ever in the United States. In that season, a record 11 hurricanes made landfall in the United States; a record five (5) named storms made landfall in the Gulf of Mexico states; and ten storms underwent rapid intensification, a process that requires extremely warm water (near or above 30 °C, 86 °F). Climate change also led to several anomalous events in 2021, like the hurricane-force winds in April that capsized the Seacor

Power lift boat and killed 13 people; deadly tornadoes in December that killed 100 people in Kentucky; and Hurricane Ida—which devastated Grand Isle, Louisiana—claimed 75 lives along its five-day path to Philadelphia and New York City where it resulted in deadly flooding.

These are some of the dramatic events, the ones that capture national attention and make headlines. There are also gradual environmental changes in the form of sea-level rise, incremental increases in "nuisance flooding," coastal land loss, land subsidence, heat waves, and, of course, the slow march of drought. Combined with aging and deteriorating infrastructure, it is easy to understand the dire warnings in the IPCC Working Group II Report cautioning that some areas will become "uninhabitable."

On **economic transitions**: thanks to COVID–19, we all have a new sense of how quickly societal fortunes can shift and what a "new normal" can look like. One thing remains true: a healthy economic base is one of the capitals of community resilience. In a primary driver of our economy, the energy sector, key transitions are underway. These include a shift from oil and gas production to exportation driven by high domestic onshore production; a dramatic decline in production of both oil and gas in shallow waters of the Gulf of Mexico since 1996; a significant increase in the production of oil in deeper waters in the same time;[1] and a transition to clean energy in electricity generation and transportation. These transitions will manifest in how and where we travel, and what the future workforce needs could be. For example, major multinational energy companies, such as BP, Shell and Total, have recently made commitments to achieve net-zero in their internal emissions around mid-century and are shifting their core businesses towards a more balanced portfolio that includes renewable sources.

In 2019, 99.3% of the oil and 99.5% of the natural gas produced in the US offshore was from the Gulf of Mexico,[2] and the region's energy dominance will continue for the near future. Even still, major hydrocarbon-producing states like Louisiana and Texas are beginning to plan for a future with substantially less greenhouse gas emissions and less economic dependence on fossil fuels. In fact, Louisiana published its first Climate Action Plan this year that outlines major strides to achieve net-zero greenhouse gas emissions for the entire state economy (Climate Initiatives Task Force, 2022). It is clear that changes in these and in other sectors will continue. The challenge is to ensure these changes occur in ways that allow our economic bases to remain robust—even dominant—as a foundation to resilience will require.

On **population transitions**: Where communities are located, how land is used and developed, and population density and demographics all affect how extreme weather impacts people. Disasters do not discriminate, but low-income populations, racial and ethnic minorities, the elderly, renters, non-native English speakers, children, and those with mobility challenges are disproportionately affected (NASEM 2019). Climate change is a threat- and a risk-multiplier. In other words, disasters magnify the inequities that exist in societies such that those who are already at a disadvantage see their disadvantages compound when disasters strike. Population density drives much of the impact, losses, and costs of climate change, which is why urban areas have the deepest pockets of vulnerability due to the high concentrations of people exposed to a single event. More than 82% of the US population lives in urban areas today, reflecting a gradual but steady increase from the 73% urban population 20 years ago[3]. Nearly 100 million Americans live in coastal areas (including coasts of the Gulf and Great Lakes), and 60 million of those people live in the areas most vulnerable to hurricanes (US Census, 2019). Development patterns, impervious surfaces, and building materials—these all influence whether our built environment will help us or hurt us when the weather turns extreme in terms of flooding, heat, and wind. In short, the ways and places in which we live are likely to continue to impact and be impacted by our changing environment (NOAA, 2021).

Thus, the mix of people, economy, and the environment shape the changes coming our way. At the Gulf Research Program, we seek to find balance and alignment across the diverse priorities and challenges of the environment, energy, and the people of the Gulf Region under conditions of change and uncertainty. The five states

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[1] Burgess, G.L., K.K. Cross and E.G. Kazanis. 2020. *Estimated Oil and Gas Reserves Gulf of Mexico OCS Region, December 31, 2018.* Bureau of Ocean Energy Management, New Orleans, LA.

[2] U.S. Energy Information Agency. www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm Aaron O'Neill. https://www.statista.com/statistics/269967/urbanization-in-the-united-states/ February 2, 2022

[3] Aaron O'Neill. https://www.statista.com/statistics/269967/urbanization-in-the-united-states/02 February 2022

around the Gulf of Mexico—Texas, Louisiana, Mississippi, Alabama, and Florida—account for more than 60% of the federal disaster relief fund expenditures. If we can find a workable balance in this region across energy, the economy, the environment, and people, this region could serve as a model for other parts of the country.

RESILIENCE IS LIKE A ZIPPER

An integrating approach that works across levels of government to connect communities to the knowledge and resources they need is essential.

Resilience is many things: a spring (physics), a curve (Madni et al, 2020), even a set of community assets (NASEM 2019). I think of resilience like a zipper: there are many dimensions and pieces to it (the teeth) that when undone do not do anyone much good. But together, it connects distant ends with lots of steps and pieces in between them into something useful, strong, and protective.

One end of this zipper is the officials and communities at the local level and the other end is the national guidance and federal resources. Resilience emerges in the connecting of these ends when local communities are able to harness support from all levels of government—under a mix of policies and practices—to plan and prepare for, absorb, respond to, and recover from disasters and adapt to new conditions (NASEM 2012). The Stafford Act provides guidance, authorities, and resources for essential support functions in responding to a disaster, but this focus on post-disaster funding may inadvertently contribute to the chronic underfunding and inadequate investments in local and state authorities for preparedness and adaptation (Hill, 2022). So, another function of the zipper is to connect post-disaster resources with those related to planning, mitigation, and adaptation.

The Gulf of Mexico region provides excellent examples for how this kind of resilience zipper can work. The Gulf Research Program (GRP) was created with an endowment from the criminal penalties from the Deepwater Horizon oil spill, and our charge is to use science, engineering, and medicine to enhance offshore energy safety, environmental protection, and community health and resilience to benefit the people of the Gulf. Our role is like the slider and the pull on a zipper; the environment, energy, and climate dimensions, as well as the data and resources associated with them, are like the teeth; the top end has the federal resources and authorities; and the base and the foundation of the zipper, is the local communities. The GRP, specifically, and science, more generally, can help interpret and translate data; connect the federal family of resources with local priorities; and build capacity in the region for local solutions to address the issues related to offshore energy, the environment, and the people.

Data and information. If the IPCC Working Group II Report tells us anything, it is that a strong scientific evidence base supports their dire warnings and predictions. Sometimes, it is hard to know what to do with data in the contexts of smaller geographies, regional dynamics, or resource-constrained decision making. Organizations like the GRP can be very helpful in working with local entities to interpret, translate, and apply data. Let's take sea-level rise in the Gulf of Mexico region: later this century, changes in sea level relative to the land will be a significant factor affecting coastal ecosystems and communities in the Gulf. More reliable projections of relative sea-level rise are needed for natural-resource management, restoration, and ensuring the resilience of Gulf communities (NASEM 2018). The GRP works at the regional scale to interpret, translate, and describe sea level variation and rise specifically within the Gulf of Mexico. Ultimately, the GRP's work will apply this understanding to more reliable forecast models and projections, making the science and data more relevant and useful to local and regional decision makers.

Federal agencies as a resource. The federal agencies provide structure, guidance, and yes, sometimes limitations, to local activities related to building equity and resilience. The GRP will connect and facilitate the best and the most helpful elements of federal resources to local resilience efforts. For example, through the GRP regional sea-level rise work, we require our partners to work with the National Aeronautics and Space Administration (NASA) Sea Level Change Team or NOAA's Center for Operational Oceanographic Products and Services (CO–OPS) to capitalize on those federal programs' deep datasets, responsibilities, and institutional knowledge for more accurate regional sea level predictions. To ensure that the base of the zipper is included, the GRP further requires these models, projections, and information products to be useful to end-users, including decision-makers, natural-resource managers, and state and local entities. Other federal agencies are also resources to the Gulf, given the billions of dollars the region receives in disaster funds each year, plus the substantial flood protection and navigation infrastructure in the region. In November 2021, the same day President Biden signed the Bipartisan Infrastructure Investment and Jobs Act into law, the GRP held a "serious game" workshop on fed-

eral infrastructure investments in the Gulf of Mexico region for Gulf-based experts and federal agencies. It was viewed as highly successful, and we plan to rerun the "serious game" in the Gulf region this spring.

The more we all can connect the resources and authorities of the federal agencies with the needs, expertise, and capacity at the regional and local scales, the easier it will be to bend the climate arc toward equity and resilience.

THE FIERCE URGENCY OF NOW

We have a window of opportunity to make investments today that will create a more prosperous, healthy, and equitable future for all Americans.

Dr. Martin Luther King, Jr. spoke of the "fierce urgency of now" in his famous "I Have a Dream" speech; in his Nobel Peace Prize acceptance speech he added, ". . . Our very survival depends on our ability to . . . adjust to new ideas, to remain vigilant and to face the challenge of change." When we talk about climate, equity and resilience, Dr. King's words from a generation ago ring prophetic now. The climate is changing, and the future looks grim and the challenges are mounting. The IPCC report warns that our window of time to act is closing, but it is still open. The time to act is now. The generations of the future depend on our actions today, and they will know what we knew, when we knew it, and how we chose to act.

The good thing is that we are positioned to start this work: we have information, resources, and motivation to make sure we avoid the worst of the predicted changes. The scientific community has generated rich data that describe and explain how physical and natural environments are changing, economic and other forces that drive those changes, and consequences of those changes. Models exist to help us understand how dynamics shift in future scenarios under different conditions. Social scientists have quantified ways that social inequity is entrenched in many of our laws, policies, and allocation of resources. They have given voice and an evidence base to the acute vulnerabilities faced by the elderly, poor, ethnic and racial minorities, and disenfranchised people in communities around the country and around the world. Federal, state, and local governments are embarking on long and sometimes uncomfortable investigations into how their policies affect people unevenly, as some policies can benefit one set of people, have no effect some, and can even bring harm to others. Reports like the IPCC Working Group II Report, the National Academies' reports on Urban Flooding (NASEM 2019) or Community Resilience (NASEM 2019), and numerous peer reviewed journal articles help frame these issues in a holistic, connected way. We cannot say we do not know.

The key is to start with the fierce urgency of now. The Gulf region is a good place to start. The Gulf of Mexico region faces acute and costly risks, sea-level rise, climate change that produces more intense hurricanes, and aging or abandoned infrastructure both on- and off-shore. The communities most at risk are those that are least equipped to withstand the current and future challenges they face. With the bipartisan Infrastructure Investment and Jobs Act, we have the promise of a once-in-a-generation infusion of funds to improve critical infrastructure. These funds are designed to reach communities through existing federal programs, layered with the Justice40 Initiative to ensure that 40 percent of these funds benefit disadvantaged communities that have been historically marginalized[4]. Examples of funds that could be used to make a real difference in how communities approach climate risks include: HUD's Community Development Block Grants (CDBG) series; FEMA's Hazard Mitigation Grants and Building Resilient Infrastructure and Communities programs; Army Corps of Engineers' Climate Preparedness; NOAA's coastal resilience programs, and many others. The GRP aims to work in a small number of pilot communities around the Gulf region to connect the local capacity, expertise, and priorities; scientific information; and federal resources to build equitable and resilient infrastructure for communities to withstand and thrive in the face of climate change. GRP brings expertise in physical sciences, engineering, environment, health, and social justice and acts as a neutral convener. As such, we engage communities, facilitate plans, and work with federal agencies and local communities together to build resilience, support the economy, reduce inequities to withstand expected effects from climate change.

The past few years have previewed what living with climate change could be, and it portends a difficult and expensive future. Billion dollar price tags have accompanied fires in the west, a crippling ice storm in Texas, deadly heat in the Pacific Northwest, and, of course, record hurricane seasons, all while the world was under

[4] On January 27, 2021, President Biden signed Executive Order (EO) 14008, *Tackling the Climate Crisis at Home and Abroad,* creating the government-wide Justice40 Initiative.

the vice-grip of COVID–19. One option: we could wait to take action, or we could start now. We can use our 2022 situated knowledge to create smart approaches that bend our future arc towards equity and resilience. Developing a coherent and robust response to the challenges and threats posed by climate change is within our grasp. The work of this committee demonstrates that there is necessary common ground for constructive action to effectively prepare for an uncertain future. We can use the best science and predictions to design infrastructure, energy options, and development for the future so that, in the words of General Thomas Bostick, 53rd Chief of Engineers of the USACE, "in 100 years, people will look back on what we did today, and say we did the right thing."

I thank you again for this opportunity to appear before you and all of the members of the Committee today on this panel.

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Ms. CASTOR. Thank you very much. Now we will move to member questions. I will recognize myself for 5 minutes for the first round. Thank you all for your outstanding testimony.

Dr. Augustine, you are right to highlight what the IPCC, the world's top scientists, recently said, and that last report was eye opening, that there is a rapidly closing window for us to act. And I love what you highlighted, that there are such knowledgeable people all across the country in communities that are ready to look for the best bang for the buck. We don't have unlimited resources to do this. We have got to be smart and targeted, and right now, climate and adaptation planning across the country is done on an ad hoc basis. It is very inefficient, as Dr. Hansen has said and has given us some good recommendations. I traveled to Norfolk at the invitation of Congresswoman Elaine Luria, and Don McEachin, and Bobby Scott, and they are kind of leading the way on their community planning. In the Tampa Bay area at home, we are. I have seen Miami-Dade, but there are so many communities that do not have the resources. They may not have even a Chief of Police, and they are the ones that really need help.

So let me start with Dr. Hansen and then I will go back to Dr. Augustine. We have put in some money in the Bipartisan Infrastructure Law for FEMA Building Resilient Communities, but we don't want to be in emergency response mode. We want to be proactive up front. What is the proper structure, what agencies need to be involved, and then how do we empower communities

across the country? This cannot be top down. It has got to be from the bottom up, listening to folks like Mr. Jewell and other local officials and experts, on how we plan to adapt. What do you say, Dr. Hansen?

Dr. HANSEN. Thank you. This really needs to be an across government approach. Every agency needs to be requiring that for Federal dollars to be spent, that the climate risk was evaluated and the spending that is taking place is, in fact, not dramatically vulnerable to climate change. But that also is going to require local planning that has a climate lens as well. So we absolutely don't want it to come to FEMA having to do repairs. Fortunately, FEMA now has a different course of action than it used to. Previously, FEMA would require that you build back in the same location, the same way, in order to get those funds. We need to make sure that everything that we are doing from here forward is climate smart, and that it is built to last. So that has to be literally across the board, every agency, everything they are doing.

Ms. CASTOR. Okay. Dr. Augustine, thank you for your work in the wake of the worst environmental, economic catastrophe, the Deepwater Horizon. I still remember it very well. Even though oil didn't wash up on the coast of Florida in my neck of the woods, boy, it devastated our economy, and we are still living with the environmental impacts as well. So climate change is similar. It is out there. It is causing horrendous damage, raising costs. We know we have to reduce our reliance on fossil fuels over time, but we would have to adapt as well. What is going on at the local level? What do you recommend to us to empower local communities so that we do have that grassroots approach that they are making the decisions on when funding comes down to adapt? How do we make sure that they are kind of leading the way while Federal resources flow from agencies?

Dr. AUGUSTINE. I think this is a great question, and I would say that the appetite is very strong at the local level. It is amazing. Public servants, like Mr. Jewell and others at this local level, really want better information. They want actionable information. They want me and my science community to provide information that they can use, that can be understood, that relates to where they live. Not to put words in your mouth, but this is what we hear. And so one of the things that comes to mind is that we do start at that local level to the degree that we can, and, in my experience, there are many communities that are crying out for help. They want some people to help them interpret data, translate information that seems quantitative or even confusing, and they don't know what to do with it.

So with that, I can go back to my little zipper analogy because there are a lot of Federal resources, most that come after a disaster. You know, the really long and strong money that comes after a disaster but if we could find ways to bring in the pre-disaster options, you know, and it crosses the Federal agencies, some in NOAA, some in HUD, some in DHS. I mean, they are kind of all over the place, but there are abilities to get that mitigation money, that adaptation money, and link that with the post-disaster recovery and relief money.

Ms. CASTOR. Thank you. Mr. Graves, you are recognized for 5 minutes. Oh, excuse me. Mr. Carter, good morning. You are recognized.

Mr. CARTER. Thank you, Madam Chair, and let me begin, Madam Chair, by saying that I echo the comments that were made by the Ranking Member earlier today. And I can't help but say that what we are going through in this country right now is totally ridiculous, and the Ranking Member was right. What has it resulted in, this failed policy of this Administration? Higher prices, higher emissions, and energy insecurity. All of this did not have to happen. All of this could have been avoided. So, again, I just want to say that I echo the comments of the Ranking Member and thank him for those comments earlier.

President Jewell, two things I want to disclose before I start. First of all, I was a mayor in another life. I served at local level, I served the state level, now I serve at the Federal level, so I know exactly what you are experiencing here. Secondly, and most importantly, two of the most precious people in my life live in Jefferson Parish in Metairie, a 1-year old and a 3-year old, two granddaughters there, so this is very important to me. They just bought a new house in Metairie, and I know exactly what you are talking about when you are talking about the price of flood insurance. So I just want to make sure you understand where I am coming from here.

You talk about Risk Rating 2.0 and how it will put an unbearable financial burden on homeowners and actually cost up to, I believe it is $7,000, maybe even $8,500. Can you just expand on that a little bit more?

Mr. JEWELL. Yeah. Thank you, Congressman Carter, for that question, and let me just say that St. Charles Parish borders Jefferson Parish. We are about a 10-minute drive from Metairie. And what is interesting that we are seeing around these new policies, not just in St. Charles Parish but in Jefferson Parish where they are actually protected by the HSRR System, which is the Hurricane Storm Risk Reduction System that was designed by the Corps of Engineers. It is a 100-year storm protection system. Under the old NFIP that played a very big role under how much you paid for flood insurance, if you are protected from that 100-year storm, you don't have that same risk. And what we are seeing now is that policies in St. Charles, policies in Jefferson, or even behind that Risk Reduction System, are seeing these huge hikes. And what we are seeing is that for new home policies, so these policies that were traditionally maybe in X zone, and for members who don't know, an X zone is an area on a flood map that is considered to have very little to no flooding risk. Usually it means you have a higher elevation. We are seeing even policies in those areas that were around $500 under the old NFIP system, now as high as $3,500, so a huge jump.

And what happens is for people who are planning to build a house, myself included, you can't plan for this change, and you end up paying tens of thousands of dollars just in insurance, and it becomes unaffordable. So we really would love for FEMA to come back to the table and work with us on this issue because right now,

this policy is threatening to stop further expansion in this region, and for existing policies, they are going to start going up.

Mr. CARTER. So basically, what you are talking about is the difficulty in navigating the Federal Government and agencies within the Federal Government.

Mr. JEWELL. Yes. You know, it is really incredibly hard to navigate the Federal Government because they are looking at things through different lenses. I mentioned in my testimony the paradox between FEMA and the Corps of Engineers. I mentioned a $1.5 billion levee project called the Upper Barataria Risk Reduction System, and on one hand, the Corps is saying that this $1.5 billion investment is worth it. It actually has a return on investment in 50 years at $30 million dollars a year. But on the other hand, FEMA is basically saying there is going to be nobody to protect because we are going to force people out of this area. So it is incredibly hard not only to navigate just the permitting and the environmental regulations around these projects but also to have FEMA on top of that making unaffordable policies on our residents.

Mr. CARTER. Okay. Real quick. I got about 1 minute left. In your testimony, also you mentioned nuclear technology in St. Charles Parish. And in my home state of Georgia, we are working to get Plant Vogtle reactors, the only two reactors currently under construction in the United States right now, we are working to get them up and running. Can you talk about the benefits of nuclear energy as part of an overall strategy for a clean energy future?

Mr. JEWELL. Yes. So, you know, nuclear has to be a part of our energy mix. In my parish, we have the Waterford 3 Nuclear Power Plant. Right next door, you have Waterford 1 and 2, which are natural gas plants. So those intermittent sources come in and help that baseload source in times of high demand. So, just to put it in perspective, and I just find this stat fascinating—one uranium fuel pellet, which is the size of a pencil eraser, is enough to replace 1 ton of coal. It has the same energy capacity as one 1 ton of coal, 149 gallons of oil, or 17,000 cubic feet of natural gas. So Waterford 3 is in my parish, and it produces 1.1 megawatts of carbon free electricity, again, enough to power 750,000 homes. So, if we want to reach our climate goals, I am fine, and I think everybody in the country is fine, having all the renewable intermittent sources, but you need that baseload generation, that carbon free baseload generation of nuclear to have a robust energy economy.

Mr. CARTER. Thank you very much, and I will yield back. But thank you, and I am pulling for you.

Ms. CASTOR. Next up, Congresswoman Bonamici, you are recognized for 5 minutes.

Ms. BONAMICI. Thank you so much, Ms. Castor. Thank you to all of our witnesses. We appreciate your testimony and your expertise. I want to start by noting, especially in response to some of Dr. Augustine's testimony, that yesterday in the Committee on Science, Space, and Technology, we heard from NOAA, Department of Energy, NASA, and the GAO specifically about their adaptation and resilience strategies, including their interagency collaboration and the use of climate data in agency planning, implementation, and outreach. And I just want to put that on the record because there is a lot of connection with what we are talking about today.

And, Dr. Hansen, I wanted to mention that when we do this work, we think about our own children, but also future generations. My son, who is now a 33, was born 2 months after James Hansen—I don't know if you're related—then with NASA, testified on the Hill, raising the alarm about Anthropogenic Climate Change. That was in 1988, and he raised that alarm back then. So my first question: the most recent IPCC report makes it clear that we need immediate and significantly bolder and more effective efforts to help communities respond to the climate crisis. Successful adaptation efforts need to be region specific while also incorporating the lessons learned at the state, local, Federal, and international levels, and information sharing is really essential.

So, Dr. Augustine, how can Congress leverage Federal resources and knowledge to support what communities on the ground need when it comes to adaptation and climate resilient development?

Dr. AUGUSTINE. Well, thank you for that question, and there are some options for Congress to be helpful here. I think there's a role the local levels are looking for some appropriations to get started. I think that there is a lot of interest in getting Federal funds and getting applications and proposals written, but, in some cases, the capacity is missing. And so it is very enlightening to see the Justice40 Initiative come through, that some of this money is targeted to the historically marginalized communities. But there is a need for some, I would call it almost, like, startup money. Not every community can afford the big consulting firms to get a really good proposal in. And so, if there are some funds that are made available for communities to be able to build that capacity and connect their needs with some of the big Federal resources that are available, I think that would be a really big start.

Ms. BONAMICI. That is a great suggestion. Thank you.

Dr. AUGUSTINE. Yeah, and I think that the last thing is just to really encourage some sort of coordination across these Federal programs. I mean, like you mentioned there is NOAA and NASA.

Ms. BONAMICI. Great. Great.

Dr. AUGUSTINE. And there are all these pieces, and it can be confusing and overwhelming because of that.

Ms. BONAMICI. Appreciate that, and I don't want to cut you off, but I want to try to get another question in.

Dr. AUGUSTINE. Yes.

Ms. BONAMICI. And this is going to be for Dr. Solecki. The populations hardest hit by the climate crisis and with greatest adaptation challenges are those that have experienced the greatest marginalization. And we know climate change symptoms, such as extreme heat and drought, disproportionately hurt lower income communities, and primarily black and brown communities. So, Dr. Solecki, you talked about maladaptation in your testimony. If adaptive planning does not account for inequities, how can that lead to maladaptation? And I want to note that in Portland last year, it was 116 degrees, so in answering this question, please use extreme heat as a starting point.

Dr. SOLECKI. Sure. Well, thank you for the question. The immediate response goes back to a comment made earlier about climate change being a risk multiplier. So, in these communities, marginalized or more vulnerable communities, you know, the risk

of climate change often concatenates with other risks that we see. And in truth, there is a perception that, you know, there are multiple sort of questions and threats sort of facing these communities. So, with respect to, you know, maladaptation, oftentimes we find, you know, adaptive strategies, like urban greening and sort of enhancing the quality of life in cities, in some cases lead to a green gentrification, or sometimes defined as "climate gentrification" where communities, neighborhoods become more desirable and, in turn, higher rents, higher rates, and then dislocation. So this is just, you know, one example that you see in with respect to maladaptation and heat mitigation.

Ms. BONAMICI. That is very helpful, and it looks like I am just about out of time, so I yield back. Thank you, Madam Chair.

Ms. CASTOR. Thank you. At this point, due to votes on the floor, we are going to take a quick recess for 10 minutes so folks can vote on this motion to adjourn. Then we are going to come back and try to keep going before the next round of votes.

[Recess.]

Ms. CASTOR. The committee will come back to order.

At this time, I will recognize the Ranking Member for 5 minutes for questions.

Mr. GRAVES. Thank you, Madam Chair. Madam Chair, I want to respond to your comment earlier about the Russian oil ban. So you are right, there is a bill on the floor. I think I saw the text on it at 1:30 a.m. It is 17 pages. There are about probably 5,000 pages of text that was dropped last night at 1:30 a.m. that we are going to be voting on today that appropriates approximately a gazillion dollars that no one has read. So give or take a little bit. So let's talk about those two things real quick.

Number one, on the Russian oil ban. I have proposed amendments to bills in the Transportation Committee and the Natural Resources Committee to ban Russian oil now for about 3 years, and every single Democrat on the committee has opposed that legislation. So we are going to shut it down now. We are going to ban Russian oil now because it is politically popular, because what happened was, rather than producing energy domestically, we instead, last year, nearly tripled the importation of Russian crude oil into the United States—nearly tripled it—which then funded, effectively, Putin's aggression in Ukraine. The last time that Putin invaded Ukraine was Crimea. That was back when we were similarly in a Democrat Administration, and we were similarly dependent upon Russian oil at a peak level. There is a trend there, Madam Chair.

So what we going to do now is we are going to ban it, but we are going to ban it absent any type of strategy to backfill. For the people that don't do this on a daily basis, Russian oil is a heavier oil. You can't take light oil and send it to a heavy refinery. You can't make some of the products that you make from heavy oil with light oil. There is no backfill strategy. So, yes, prices are going to go up. Yes, this was totally, totally preventable, and it is a result of failed or really just no energy strategy. Now, let's go over to the 5,000-page appropriations bill.

President Jewell, you represent St. Charles Parish, ground zero for some of the incredible devastation from Hurricane Ida. Let me

see if I remember this right. So, on September 30th, we appropriated funds for 2021 disasters, including Hurricane Ida, about a month after the storm. To date—to date—not one penny of the funds has even been allocated, which simply announces how much of it is going to go to Louisiana for Hurricane Ida. After they announced the allocation, they then have to do a *Federal Register* notice that sits out there. You then have to do an action plan on how you are going to spend the funds. The action plan has to be considered and reviewed. Then you can potentially start allocating funds.

Let me put it in perspective. In the 2016 flood disaster, I think $1.7 billion was appropriated over 5 years ago. To date, of $1.7 billion, less than $700 million of it has been allocated to flood victims. So, the bill, the 5,000 pages includes zero additional funds for Hurricane Ida victims, our Democrat governor of Louisiana asked for approximately $3 billion in funds. How does that make you feel that we are spending money on Haiti, we are giving funds to Ukraine, humanitarian aid, which I support, but we are giving nothing to the people that you represent?

Mr. JEWELL. Well, thank you, Congressman. It is incredibly disappointing to hear that. We definitely support the funding going towards Ukraine, but it is incredibly important since we are still in the midst of recovery in Louisiana, we still have people living in temporary housing, people still actively trying to fix their homes, that we get the funding necessary to rebuild and to build back in a way that is going to be a little bit more resilient than what we have seen in the past. And to give you an example, we still have hospitals that have temporary roofs on them. We still have government buildings in my parish and other parishes that have temporary fixes and are waiting to fully recover.

Mr. GRAVES. Yep. And you and I met with President Biden. And I want to be clear, I appreciate the President working with us on the first round of funding in terms of helping us get it in the appropriations bill. But no funds have been actually allocated or made available to the people that you represent. So this hearing is about resilience. St. Charles Parish is in the coastal zone, under the Gulf of Mexico Energy Security Act, that parish is eligible for GOMESA aid, for aid that is tied directly to energy production. When this Administration refuses to do a lease sale, despite court orders at one point refused to do a lease sale for additional offshore energy, which I will reiterate, lowest emissions associated with domestic production, your parish doesn't get money for GOMESA. What do you use those funds for? What are you required to use GOMESA funds for under the state's constitution?

Mr. JEWELL. Yeah. Under the state's constitution, GOMESA funds have to go towards things like flood protection and coastal restoration, which are impacted by things like climate change. And right now, St. Charles Parish is actually leveraging the dollars that we do get to get a bond and work on projects that are going to protect our residents.

Mr. GRAVES. So said another way, the lack of energy production, the lack of following the law and doing new lease sales, it makes your parish more vulnerable at a time when they are trying to recover.

Mr. JEWELL. Right.

Mr. GRAVES. Fascinating. Madam Chair, I am out of time, but I think it is really important to note the relationships there. I want to thank President Jewell, and I do have some questions for the record for you on Risk Rating 2.0 and the implications of your constituents. Thank you for your leadership efforts in fighting that flawed policy.

Mr. JEWELL. Thank you.

Ms. CASTOR. Next up, Representative Casten, you are recognized for 5 minutes.

Mr. CASTEN. Thank you, Madam Chair. You know, I often find myself trying to imagine a situation where every American woke up every morning and got hit in the head with a hammer, and if that happened, we would probably think, you know, we should probably stop hitting people in the head with hammers. Alternatively, we could, I don't know, spend a lot of money to invest in helmet technology. And, President Jewell, you are dealing with the consequences of climate change and the helmets from levees, to flood insurance, and all the things you have to grapple with. And I have a lot of sympathy with my friend Mr. Graves because he represents a district where the economy depends on hammer manufacturing. That is really hard, and we have got to a grapple with that, but I want to focus on the helmet because that was the subject of your testimony.

The IPCC report that recently came out described climate change as, I think they said, "The rate of climate change is outpacing our ability to adapt." The NOAA report that just came out said that we have got 2 feet of sea level rise on the Gulf Coast by 2050. I am just curious, you sitting there as the president of your parish, how many of the homes in your parish are within 2 feet of sea level?

Mr. JEWELL. I don't have that number off the top of my head, but we do have a fair number of homes that are close to sea level or just above.

Mr. CASTEN. Okay. So if I was to move to St. Charles Parish tomorrow and try to get a 30-year mortgage, because by 2050, that mortgage isn't going to be fully paid off, could I get a 30-year mortgage if I was to move to St. Charles Parish?

Mr. JEWELL. You absolutely would be able to get a 30-year mortgage, but you probably wouldn't be able to afford your flood insurance.

Mr. CASTEN. Okay. And who is taking the risk of that mortgage, because if you know it is going to be underwater in 30 years, who is holding that paper?

Mr. JEWELL. The banks are.

Mr. CASTEN. Fannie and Freddie or the commercial banks?

Mr. JEWELL. Commercial banks. I mean, there is still active lending going on in St. Charles Parish, in coastal Louisiana because we have made such investments, like in levees and flood protection, to protect us. But where we are seeing a lot of the inaction are on some of the big coastal restoration projects because of the hurdles that we have to jump through.

Mr. CASTEN. Do you carry much debt in your parish?

Mr. JEWELL. Do I carry much debt? No.

Mr. CASTEN. Yeah. Now, if you wanted to go out and get long-term paper, you know, if you have got a road you need to build

where the cost of recovering that bond is going to get beyond 30 years, can you get that debt?

Mr. JEWELL. Absolutely.

Mr. CASTEN. What is happening there?

Mr. JEWELL. No, absolutely. We just did a bond against our GOMESA revenues, which is, I think, a 30-year payment as well. But, again, that money is going into things like coastal restoration, flood protection, and things like that.

Mr. CASTEN. Okay. Well, there was a CFTC report that came out under the Trump Administration last year that looked at how financial risk was rippling through our financial sector, and they echoed your point. The commercial banks are still writing those mortgages, but they are increasingly putting those on to Fannie and Freddie. When I asked Chairman Powell last week if Fannie and Freddie were changing their risk profiles, in response to that, he said, no, but they should. I followed up by saying, okay, I spent 20 years in the energy industry. I built a lot of projects, raised a lot of money. Everything I know about finances, it depends on informational asymmetry, you know, the old joke that if you sit at a poker table and you look around and you can't spot the fish, you had better leave the poker table because you are the fish. And what that CFTC report found was that the more likely you are to be in a flood prone region, the more likely the banks are to offload that risk on to Fannie and Freddie.

So our failure to remove the hammer is causing the taxpayers to invest more and more in helmets, right? And the fear I have, and I think it goes to what all our witnesses are talking about, is that if we don't think about taking away the hammers, right, if we only focus on the helmets, we simply don't have enough money, right? And at some point, we are going to have horrible conversations, and the people who are going to lose are going to be the fish, right? The financial sector is going to move, and we have got to focus on getting rid of those hammers, and I understand that pain.

From a political perspective, with the time we have left, help us understand what happens to you if you don't get the money to invest in those helmets, if you have no choice but to tell people, all I can do is abandon the provision of this road, I can't rebuild that school, we simply can't protect that home. What happens to you politically?

Mr. JEWELL. Well, I think it is important to know that Louisiana has a plan, and that is very important. We have a coastal master plan that is a 50-year plan that is rooted in science to rebuild our coast. What we need is, A, investment in coastal restoration projects, which right now comes from the funding of GOMESA, those outer continental shelf revenues. That is the only consistent funding source for our coastal plan, so an investment in that. And things like the RISEE Act will increase that GOMESA revenue share, and they will also give us a portion of offshore wind lease sales when that becomes viable in the Gulf of Mexico, so having that funding source is what we need. We need to increase that funding source, but we also need to eliminate those regulatory hurdles so that we can start doing these projects now because we are losing over a football field of land every hour.

Mr. CASTEN. Well, I thank you for that. I am out of time, but when I look at the sea level rise that we know is coming, most of Louisiana south of I–10 is under water. And I want to make sure that in our next redistricting cycle, my friend, Mr. Graves, is still here and is not sitting there saying that my district is now under water. I yield back.

Mr. GRAVES. The rest of us, too.

Ms. CASTOR. And I have also been concerned with changes in flood insurance. There is a lot of uncertainty, but the NFIP numbers the Ranking Member cited are not exactly accurate. No policies will increase in 1 year at the rates that he stated from $560 to $7,000 or $9,000 in 1 year because there are caps in the law that prevent these big jumps in cost. I am very concerned. I have a coastal district, so we checked it out. The new price methodology in Risk Rating 2.0 implemented by FEMA and NFIB would help decrease flood insurance premiums because it is based on the risk per property rather than by zone, so it makes for more equitable flood insurance and will prevent especially lower income households from overpaying.

Within my district, 76 percent of policyholder premiums would actually decrease or remain stable under the new Risk Rating 2.0. In Ranking Member Graves' district, the information we have is that 92.5 percent of policyholder premiums would decrease or remain stable under Risk Rating 2.0, with estimated decreases in premiums totaling over $13 million for single family households. And the source is the FEMA NFIP data by Pew and Reinsurance Association of America.

Mr. GRAVES. Will the gentlelady yield?

Ms. CASTOR. I will yield for a second.

Mr. GRAVES. Thank you, Madam Chair. Madam Chair, I want to be very clear. A preferred risk policy, right now you can pay between $500 and $600 a year. As of October 1st, for any new policies, a new purchase or a new policy, if you have a home that right now is paying $560 and it is sold, the new purchaser will go to the numbers I cited. You are correct that as of April 1st, under the second phase of the program, that is when existing policy increases begin moving up, and, yes, there is a rate cap of 18 percent a year. You are going to continue moving toward that higher number. But just to be clear, my statement was entirely correct because, number one, those who are subject to the 18 percent cap, on April 1st, they are going to move to that $7,000, $9,000 premium. Secondly, those who had a purchase, or a new policy, they will immediately jump to the new figure. There is not a rate cap per year. I yield back.

Ms. CASTOR. Next up, we are going to go to Mr. Huffman. You are recognized for 5 minutes.

Mr. HUFFMAN. Thank you, Madam Chair. So, look, before I get into my questions, let me just say that my colleague from Louisiana is a good person. He is a good member of Congress. I consider him a friend. But it is hard to listen to this well traveled speech he has been giving on energy, and Putin, and related matters, and it is not because he is right. It is because he is wrong. And strong and wrong is still wrong. Sanctimonious and wrong is still wrong.

Extreme fossil fuel dependency is how we got into this mess, both the climate crisis, and Putin's war, and a whole bunch of wars before that. Doubling down on decades of new fossil fuel dependency cannot be the answer. And I agree with my colleague that simply pivoting to petro-fascists in Venezuela or Iran makes no sense. We can at least agree on that, but neither does locking in decades of new fossil fuel dependency on the United States and other oil producers at a time when we have a climate crisis, and when that response is going to make things quite profitable for the next petro-fascist. As soon as this conflict is over, Vladimir Putin goes right back to getting rich and having the resources to be a global thug, or any number of other unsavory regimes that have done the same thing.

We have got to get off this treadmill. It is not working for us. And, frankly, if you are serious about confronting Vladimir Putin, don't just repackage the same agenda that the oil and gas industry has been pushing for these past few years. It is not like they were serious about standing up to Putin. They have actually been in bed with Putin over in Russia, developing oil and gas, profiteering from Russian oil and gas, so much so that they can barely figure out how to disentangle themselves from Russia oil and gas right now in a sanctions regime, so let's be serious about that. And by the way, one of Putin's dear friends was our Secretary of State under the last regime, or the last Administration rather. It seemed like a regime.

So let's get back to questions because we do need to talk about resiliency, and we might as well keep it focused right on the Gulf Coast, right in Louisiana because that is ground zero. We could talk about other places. In California, we have got communities that have no good answer to sea level rise and extreme weather. They are going to be dealing, whether they like it or not, with managed retreat. We could talk about places in Alaska and lots of other parts of the country, but, Mr. Jewell, your area is as good as any because you are really the tip of the spear. And, you know, I guess, if we could keep the extreme weather and sea level rise from getting a lot worse, maybe through all of these restoration strategies, and restoring the function of the Mississippi River Delta, and getting back those coastal wetlands, and barrier islands, and mangroves, and everything else, maybe we could stop the loss of all that land that you described and maybe get some of it back for the good people of St. Charles Parish and other parts of Louisiana. And I am very interested in working with you on that and Mr. Graves on that.

But what if we don't stop the hemorrhaging? What if we do see 2 more feet of this sea level rise by mid-century? What if we continue to set off carbon bombs that increase our dependency on fossil fuels? And, Dr. Augustine, I will invite you to talk about this. I read an op-ed by General Honore a few weeks ago in *The New York Times,* and he talked about, you know, it is not just the BP oil spill. In the most recent hurricane, there were all sorts of environmental damage from this ubiquitous oil and gas infrastructure. Are we are going to double down on that and not expect more and more and more ecological damage, let alone the loss of communities and land? So that is my question to each of you. What if we can't stop

it from getting a lot worse? What if we double down on all this fossil fuel infrastructure? What is going to happen to that part of Louisiana and other areas in the Gulf Coast?

Dr. AUGUSTINE. What happens if we can't stop it from getting worse? That is a great question. It is the question that we have before us, and I would say that we kind of have to do two things at the same time right now. There are problems today that need solving, and we can't divert all of our attention away from those because people are here right now. At the same time, we do have to look down the road. We have to get past our myopia and think about these questions you are asking. What does it look like on the coasts with 2 feet of sea level rise, and what happens to those people who are living there?

And so I think that, just very quickly because I can see that the clock is going in the wrong way, on the coast, we do have to talk about either reinforcements, or we have to talk about movement of people. This is a very loaded topic, and it is very emotionally fraught. This is something that is part of the toolkit. And as far as the infrastructure, there is so much infrastructure in the Gulf of Mexico, for example, from the oil and gas enterprise. A lot of it is legacy, a lot of it is abandoned, and then there is new stuff coming. And so there is a big pipeline—no pun intended—that we kind of have to work both ends of that. There is a lot of work to be done.

Mr. JEWELL. Thank you, Congressman, for the question. In the case of coastal Louisiana in the sediment starved estuaries that we have, if we do nothing as far as coastal restoration and flood protection goes, and, you know, our coastline continues to wash away into the sea as it has since the 1930s when the Corps of Engineers levied off the Mississippi River, and that is why it is incredibly important that we invest now in measures that are going to rebuild the coast. Again, our coastal master plan in Louisiana, which is a $50 billion, 50-year plan, is rooted in science and it is rooted around Louisiana's economy. So I think that investing in that type of plan, restoring that coastline, protecting those shorelines, is what we can do now while we look to reach some of our future goals.

Ms. CASTOR. Next, Representative Palmer, you are recognized for 5 minutes.

Mr. PALMER. I thank the gentlelady from Florida and for our witnesses appearing today. I have been in contact with people in Ukraine by a Zoom call. I have had three of these, and we are having this discussion about resilience here. And last September, there was an article that came out about how Europe's energy policies and our policies have given Putin the upper hand. That was in October of last year. And I just want to point out to my colleagues on this committee, you are having this discussion about the dangers we face from your inflated view of climate disasters. Inflated. Absolutely inflated, and you are good on inflation. You are really good on inflation. But there were more people killed in 2 weeks in Ukraine because of these—I won't use profanity—these policies than died in the United States from any natural disaster from 2010 to 2020.

And I just wonder what should have been presented to Ukraine in terms of resilience. You talk about structural damage in the

United States, building losses, other infrastructure losses because of natural disasters, and you literally are watching on live television, cities being leveled in Ukraine because of the asinine, shortsighted, ineffective energy policies of this country, and, particularly, this Administration and this Congress. And I just wonder what we should be saying to the people of Ukraine, Mr. Jewell.

Mr. JEWELL. Well, look, I think it is incredibly important, and what we are seeing in Ukraine, it is incredibly important now to not do an about face on our current energy mix. I think oil and gas is going to be a part of our energy mix now and for years to come. I mean, we are only seeing the demand for energy go up over the next 25, 30, 40 years, so we should be showing the world what needs to be done to invest in an all-of-the-above strategy, and show the world what a robust energy economy looks like by investing in things like nuclear and renewables, and continuing with what we know how to do.

The people in Southeast Louisiana are experts at taking oil and gas out of the ground and doing it safely and cleanly with the best standards in the world. So we need to make sure that our energy policies don't let other countries, who don't do things to that high standard and who are not allies of the United States, pick up that slack.

Mr. PALMER. There are now over 2 million refugees from Ukraine flooding the borders of Poland to escape this disaster inflicted upon them, and, I mean, it is a number of things. I am not so naive to think that Putin might not have tried this, but he certainly wouldn't have the resources that he has today to carry out this invasion against Ukraine. I would point out that more people died in 2 weeks in Ukraine than died in the entire world from natural disasters in 2020, and you can pick any random person in the world in the 1920s, and there was a .01 percent chance of dying due to an extreme weather climate event. Today, 2020, that is a .00025 percent chance of dying as a result of extreme weather event, yet we are so wrapped around the axle about this that it has blinded us to history. It has blinded us to what is actually happening in the world, and we are responsible for it.

I mean, one of my colleagues mentioned the predictions for these disasters. I will just read one prediction to you that, "The greenhouse effect will desolate the heartlands of North America and Eurasia with a horrific drought, causing crop failures and food riots. The Platte River in Nebraska would dry up, while a continent-wide black blizzard of prairie topsoil will stop traffic on interstates, strip paint from houses, and shut down computers." Dr. Augustine, do you agree that that is going to happen?

Dr. AUGUSTINE. You are asking me a very hard question; that is, I have no problem saying I am not really sure. But I would say on your fatality statistics, we have come a long way, in a good way, on reducing fatalities to extreme weather, and that is a good thing. I think that it says a lot about how far we have come that we are now measuring our losses in terms of assets and economic losses.

Mr. PALMER. I have enjoyed your testimony because I think you are a serious person, and I commend you for it. And I just say that that was a prediction by Dr. Michael Oppenheimer in 1990, who predicted it would happen by 1995. And, Madam Chairman, I

would like to introduce into the record a list of 107 catastrophic predictions that haven't come true.

Ms. CASTOR. I will take that, and review it, and dispose of the motion at the end of the hearing.

Mr. PALMER. Thank you.

Ms. CASTOR. Thank you. Next up, Representative Escobar, welcome. You are recognized for 5 minutes.

Ms. ESCOBAR. Thank you so much, Madam Chair. Thanks for this hearing.

You know, as we talked about, and, clearly, that is what we are going to talk about mostly today in this hearing, is we talk about the crisis that we are facing in Ukraine with a madman who has decided to invade a democracy and a friend, and we talk about the oil dependency that we have had as a country. And somebody mentioned the word history. Let's take a look at history and the fact that we are still so dependent and even addicted to fossil fuels, and no one on the other side of the aisle is talking about how that has been the problem. Some of the same people saying we need to drill more and we need to do more drilling are some of the very same people who have stood in the way of our ability to advance sustainable forms of energy. And so, if we had led the way decades ago, as we should have, we would not be in this position where we are debating these issues. And one of my colleagues mentioned migration.

I am sorry. If you don't mind, Representative Graves, I can't hear myself think with your talking. Thank you.

I live on the U.S. Mexico border. I represent El Paso, Texas, and we have seen a record number of refugees, many of them driven by the climate crisis. And so we can talk about a multitude of problems that are fueled by our addiction to fossil fuels, and the answer is not to drill more. The answer is to finally work together. And I hope that we come to a point where Democrats and Republicans alike can work together on renewable energy so that we can finally end this addiction that is at the root of so many of our problems. While some of my colleagues want to continue to focus on more drilling, in my community, we don't have that luxury. We are facing record generational drought that is eliminating our green valleys. We are living with record heat that is killing people. And so I don't know how we are measuring death and how we are measuring success, but I think all we need is common sense to see that the impact is deadly, and we need to act.

So in my community, we are working on drafting a framework. I brought together stakeholders who are going to help put together a framework for all our local entities, for the public sector, the private sector, for key stakeholders, on how we begin to find a solution as we go forward in our own community in the absence of real action on Capitol Hill. And these climate action plans are really important, but they are expensive, and they are hard. And so, Dr. Hansen, I am going to ask you a question actually. You know, we are working on this framework, as I mentioned, in my community, in my district that will help be a roadmap, a guide for all folks who are wanting to confront the reality ahead of us instead of arguing about whether or not we should increase our dependency on fossil fuels.

Dr. Hansen, how have your programs at EcoAdapt helped environmental justice communities? You know, I mentioned how expensive these plans are. I live in an economically disadvantaged community. Also, what are some of the Federal policies that we need to enact in order to continue helping communities like mine so that they can manage their risks and adaptation, and ensure that they are acting as quickly as possible?

Dr. HANSEN. Thank you, Representative Escobar. This is such an important issue and at the heart of the points that I brought up earlier. This is why we need a National Climate Extension Service. We need a way to get resources and training to members of all communities, especially communities that are dramatically under resourced, especially communities where there are a disproportionate number of people who will be adversely affected. Coupled with that, again, has to be our ability as a nation to have a national adaptation plan wherein we only spend our funds on things that make us more resilient and better prepared for climate change. That combination of things will ensure that every action we take going forward is an action that is preparing us for the realities of climate change, and, as Representative Casten said, stopping to make hammers that are causing us damage.

So if we can have those two pieces, we can provide regular, steady, across the board resources to every community in the United States, because right now, most communities in the United States do not have the resources, the technical skills, or the bandwidth to make this happen. I worked in communities where, quite frankly, having an AmeriCorps volunteer creates their entire capacity to take on this issue, and that is not a lot of help, and it is a very short period of help. But having that person who can be the lead, who can be asking the questions, if that were also supported by all these other tools I talked about, could really move us forward in a more consistent way.

Right now, well-off communities have a better chance of having the resources to hire the staff they need, have access to the data, and have access to the resources to make the changes. But if every dollar we were spending was being spent on things that were climate ready as opposed to were climate agnostic, we would be doing a better job.

Ms. ESCOBAR. Thank you so, Madam Chair. I yield back.

Ms. CASTOR. Well, thank you very much, Members, and thank you to our witnesses for their outstanding testimony today.

Without objection, I would like to enter into the record, first, a March 2022 letter from the Union of Concerned Scientists, outlining their recommendations to the Select Committee on ways Congress can help advance climate adaptation and resilience; second, a February 2022 report of the Intergovernmental Panel on Climate Change Working Group II, titled, "Climate Change 2022: Impacts, Adaptation, and Vulnerabilities Summary for Policymakers," which summarized the report findings and the policy relevant recommendations to address the impacts of climate change on ecosystems, biodiversity, and human communities, and reviews the vulnerabilities, capacities, and limits of the natural world and human societies to adapt. Third, a February 2022 report by the National Oceanic and Atmospheric Administration on the U.S. sea

level rise and coastal flood hazard scenarios, and an Interagency Task Force report, entitled, "Global and Regional Sea Level Rise Scenarios for the United States," which analyzed sea level rise scenarios out to 2150 and assessed flood exposure to current conditions for the next 30 years. Fourth, a January 2022 report by Oliver E.G. Wing, et al, titled, "Inequitable Patterns of U.S. Flood Risk," which examined current and future flood risk under the increasing threat of climate change, including worsening risks and impacts to communities of color; fifth, a February 2022 report by the U.N. Environment Program, titled: "Spreading Like Wildfire: The Rising Threat of Extraordinary Landscape Fires," which analyzed how climate change and land use change are making wildfires worse across the globe, and how the world can better adapt and minimize the risk of wildfires.

Sixth, finally, there has been a lot of discussion of FEMA's National Flood Insurance Changes, so I will ask that FEMA's press release from April 2021 announcing the changes is included in the record, and Representative——

Mr. GRAVES. I object.

Ms. CASTOR. Okay.

Mr. GRAVES. Madam Chair, as I mentioned to you once before, in my entire life, I have never heard of a committee not allowing documents to be submitted in the record by unanimous consent until this committee did it last year, I believe.

Ms. CASTOR. Okay. So you are objecting to the email?

Mr. GRAVES. I am objecting to everything. You just held Mr. Palmer's. If you——

Ms. CASTOR. I was about to——

Mr. GRAVES. Okay. If you accept his, then I will lift my objection.

Ms. CASTOR. Yeah, I was about to accept it.

Mr. GRAVES. Thank you. Thank you. I withdraw my objection.

Ms. CASTOR. We wanted to take a look at it because we ask everyone, if they can, to submit it in advance and share it with staff.

Mr. PALMER. And I apologize.

Ms. CASTOR. Yeah, that is fine. That is fine. Things come up.

Mr. GRAVES. The rules don't require that.

Ms. CASTOR. No. Things come up during the hearing, but we just needed a moment to look at it. And so we are also asking unanimous consent for the record for Representative Palmer's letter.

[The information follows:]

Submission for the Record
Representative Kathy Castor
Select Committee on the Climate Crisis
March 9, 2022

Kathy Castor, Chair
Garret Graves, Ranking Member
Select Committee on the Climate Crisis
H2–359 Ford Building
Washington, DC 20515
climatecrisis@mail.house.gov

March 6, 2022

RE: Committee hearing on *Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience*

Dear Chair Castor and Ranking Member Graves,

On behalf of the Union of Concerned Scientists' (UCS) more than 500,000 members and supporters, we are thankful to the Select Committee on the Climate Crisis for hosting a hearing on the need for a national adaptation and resilience strategy. We offer this letter for the record for the hearing "*Confronting Climate Impacts: Federal Strategies for Equitable Adaptation and Resilience*" on March 9, 2022. We commend the Committee for swiftly moving these critical issues forward.

We, as a nation, must act urgently both to reduce heat-trapping emissions and transition to clean energy, while also fostering effective, equitable adaptation to ensure that people and communities are equipped to withstand increasingly severe and disruptive extreme weather and climate-related impacts. The recent Intergovernmental Panel on Climate Change (IPCC) report on climate impacts, adaptation, and vulnerability [1] makes clear that climate change is already a grave threat to people and the planet, disproportionately affecting marginalized communities, and that incremental adaptation measures are grossly insufficient when compared to the whole-of-society, transformational adaptation measures that will be required to ensure human safety, wellbeing, healthy ecosystems and a livable planet in a warmer climate.

This is a pivotal moment for bold action. Many communities across the U.S. have an acute need to build their resilience to the climate impacts they are already coping with, including deadly heatwaves, increasingly severe wildfires, record-breaking drought, and worsening floods. For a growing number of communities, their current infrastructure, local economies, and ways of life will be at even greater risk of climate-change related impacts in the near-future. The IPCC report highlights that more communities will increasingly come up against hard and soft limits to adaptation unless we act swiftly. Therefore, we call on Congress to enact bold legislation to establish a national resilience strategy and bolster the urgent need for data, science, technical resources and funding to deliver on it. To truly address the nation's resilience needs in an integrated and comprehensive fashion, a national resilience strategy would need to include these six foundational elements:

1. **Aligned ambition on mitigation and adaptation.** Similar to the IPCC report's framing of climate resilience, UCS's "Resilience Gap" framework [2] recognizes that successfully building climate resilience will necessitate both limiting the future extent of climate change by sharply reducing heat-trapping emissions (*i.e.,* mitigation) *and* adapting to the changes that will no longer be avoidable. Aligning mitigation and adaptation efforts to advance climate-resilient development will have multiple health and economic benefits, including protection for people, livelihoods, and critical ecosystems from climate impacts. By contrast, lagging on one front or the other will guarantee that neither effort can ultimately succeed. A national resilience strategy must derive from this understanding and, even as it drives much-needed adaptation action, appreciate that ambitiously curbing emissions is our only hope of creating a climate future to which we can successfully adapt.

[1] *See* www.ipcc.ch/report/ar6/wg2/
[2] *See* www.ucsusa.org/resources/toward-climate-resilience

2. **Investment in a science-informed national resilience strategy.** Congress must ensure that the federal government is armed with the latest and best available climate change science across a range of worsening climate risks, and their intersection with socioeconomic and other factors that heighten vulnerabilities. State, local and Tribal governments and communities also need access to actionable climate science to inform their efforts. While important progress has been made on climate risk science, including through the essential work of the US Global Change Research Program, there remain many gaps in data and supporting infrastructure. This includes the need for more stream gauges across the country, better flood risk mapping and frequently updated precipitation frequency estimates, better wildfire risk mapping and warning systems, heatwave early warning systems, and data on compound and cascading risks. Further, as the IPCC report points out, elevating and including Indigenous knowledge and local knowledge is essential.
3. **A focus on equity and justice.** The evidence is abundantly clear that in the U.S. and globally those most impacted by climate change are often people of color, people with low incomes, and other communities that have been disadvantaged and marginalized. These communities must be prioritized for adaptation investments. The Biden Administration's Justice40 Initiative and the in-progress Climate and Economic Justice Screening Tool are an important start. Congress must embed these approaches in legislation, together with robust funding, to ensure accountability for climate justice from the federal to the state, local and Tribal level. To truly build resilience across the U.S. will be a multi-generational effort; here in 2022, our nation's resilience strategy must commit to a tireless pursuit of equitable outcomes, building a resilience workforce and just transformation.
4. **A whole system approach toward building resilience.** To ensure truly successful and equitable resilience and to avoid the risks of maladaptation identified in the IPCC report, there is a need for a strong and clear coordination framework from the federal to the local levels. Applying a systems-thinking approach will help to invest federal resources wisely and proactively, ensure that diverse stakeholders have a strong voice in shaping priorities, integrate the need for nature-based solutions, and boost the effectiveness of policies, programs, and tools. It should also integrate and focus federal resources based on need and how soon communities will face extreme climate impacts, like vertebrae along a spine, could form the backbone of a national resilience strategy. This approach must also include actions to protect our financial system and economy, including mandating climate risk disclosure in the marketplace to ensure that the private sector's decisions are also aligned with a low-carbon, climate-resilient future.
5. **Responsiveness to rapidly evolving, compounding and cascading risks.** There is a wealth of climate science detailing the climate impacts different regions of the U.S. are likely to experience in the coming decades, but our understanding of how climate risks are combining with other climatic and non-climatic risks and creating new threats is still evolving. Despite the exceptional science undertaken to date, the aperture through which the U.S. can see its own risks is therefore too narrow. Given the potentially vast societal harm of compound and cascading impacts, this dangerous limitation must be overcome. To build responsiveness to acute and spatially broad risks like the yet-unfolding Southwest megadrought, or the intersection of the hurricane season with a pandemic as we recently experienced, a national resilience strategy will need to include resources and nimble frameworks for identifying and responding to evolving and cascading risks.
6. **A bold and comprehensive national resilience strategy bill.** Climate change is already impacting the ways of life of communities and our treasured natural heritage and will continue to reshape our nation for generations to come. To best ensure that reshaping is neither forced upon us nor harmful, Congress should enact a bill to advance a comprehensive national resilience strategy. In particular, such a bill must include a forward-looking, integrated and equitable framework to address the full range of climate-related impacts and risks communities will face in the near, medium and long term, and the solutions that will foster effective and equitable outcomes. This should include a framework for addressing profound challenges such as climate-driven displacement and migration and compound, cascading and tipping point risks, as well as the opportunity to build safer, healthier and more sustainable communities and infrastructure for all.

In closing, UCS is eager to hear from the members and witnesses during the hearing. It's time for comprehensive and bold congressional action to combat the climate

crisis and we urge the members to work towards enacting legislation for a national resilience strategy in the 117th Congress. UCS looks forward to being a resource to the committee on any components of such a strategy. Please do not hesitate to contact us with any questions the committee may have by reaching out to Todd Wolf, *Senior Washington Representative.*

Sincerely,

Rachel Cleetus
Policy Director, UCS Climate & Energy Program

Shana Udvardy
Senior Climate Resilience Policy Analyst, UCS Climate & Energy Program

Erika Spanger-Siegfried
Director of Strategic Climate Analytics, UCS Climate & Energy Program

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Submission for the Record
Representative Gary Palmer
Select Committee on the Climate Crisis
March 9, 2022

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This blog post is retained in the committee files and available at:
https://wattsupwiththat.com/2014/04/02/the-big-list-of-failed-climate-predictions/

Ms. CASTOR. And I would just say that the other items included in the record, as our witnesses testified today, the recent report by

the IPCC by Dr. Solecki, there is a lot of current climate science for folks to examine. The consensus is clear, it is deep, that action is urgent. There is a rapidly closing window, and I urge everyone, rather than point to decades ago, look at what is right in front of us. The world's top scientists and America's technological edge gives us the ability to look at that and do that. So thanks, everybody.

Mr. GRAVES. Would the gentlelady yield?

Ms. CASTOR. We will yield for a moment, sure.

Mr. GRAVES. Thank you. Madam Chair, my friend from California, and he is my friend, Mr. Huffman, who came down to St. Charles Parish and went on an airboat tour to see our coastal problems down there, he mentioned a few things that I do think is worth getting balanced news or information in the record. He said fossil fuel dependency is the problem. Madam Chair, the Biden Administration's EIA says that developing countries are going to need between a 44- and 80-percent increase in natural gas, that developed countries are going to need between—what is it—31 to 58 percent for developed countries. They said that you are going to see an increased demand in global energy of 50 percent over the next 28 years. So you know what? I, too, and I have told you this before, I, too, would love if we could just make everything magically run on pixie dust. I would, but right now, that is not possible. The Biden Administration says it, so we have shown before that if we stop producing, all that happens is other countries produce, and they do it with greater emissions. We can't go devise energy policy strategies that are designed on nothing, that are designed on pixie dust. We can't do that.

Ms. CASTOR. Thank you.

Mr. GRAVES. No. Madam Chair, you just spoke for 2 minutes without any recognition. I am just asking for the same courtesy.

Ms. CASTOR. Go ahead.

Mr. HUFFMAN. Madam Chair——

Ms. CASTOR. But we are going to——

Mr. GRAVES. So, Madam Chair, I remember——

Ms. CASTOR. I am going to have order, and I am going to adjourn. I am going to give you a little bit longer to go.

Mr. GRAVES. Thank you. Thank you. Thank you.

Ms. CASTOR. But please wrap it up.

Mr. GRAVES. Madam Chair, every Democrat member of this committee voted against banning Russian oil.

Mr. HUFFMAN. [Inaudible.]

Mr. GRAVES. Yes, it is true.

Mr. HUFFMAN. All right. Will the gentleman yield some of the time that he doesn't have?

Mr. GRAVES. I will in just a minute. And voted against a motion to recommit, voted against my amendments in committee. The only President in recent time or over the last 5 years that has reduced emissions is President Trump, not President Biden. So we have got to stop talking about all these things that are actually doing the opposite of what makes sense for the environment. And folks are out there doubling and tripling down on things that have contributed to energy insecurity and greater emissions.

Ms. CASTOR. Okay.

Mr. GRAVES. California and the European Union are two perfect examples of fatally flawed strategies, and I am happy to yield my friend.

Mr. HUFFMAN. May I?

Ms. CASTOR. Go ahead and take a moment since we are waiting for votes to be called on the floor.

Mr. HUFFMAN. Well, so my friend from——

Ms. CASTOR. But we are going to wrap it up here quick.

Mr. HUFFMAN. Thank you, Madam Chair. You have been very gracious and patient. And my friend from Louisiana, you know, maybe forgets that I am on the same committees as him, so these amendments he is referring to that he describes as a ban on Russian oil, I know that they were not that. They were trapdoor amendments that would have stopped some clean energy initiatives until someone completed a study of how it helped Vladimir Putin. They were gimmicks. The gentleman has never introduced a straight up ban on Russian oil, but, today, he will have a chance to vote on one, so that is the good news. If he is interested in it, let's do it. And describing clean energy as Bigfoots and unicorns, and pointing to some hypothetical demand for fossil fuel in the developing world forgets the fact that clean energy is the fastest growing source of new energy in the world on the economics of it. This is not Bigfoots and unicorns, and I have told the gentleman that we could also talk to some drug policy experts, and they would say there is an almost infinite demand for more fentanyl, and we know——

Ms. CASTOR. All right. All right. I think——

Mr. HUFFMAN. And we know it would be really bad if we let people get it, but we are not powerless. We are not powerless to change hypothetical demand curbs. And with that, I yield back.

Ms. CASTOR. Thank you all, again, for a robust debate. I look forward to the next committee hearing very much. But thank you, again, to our witnesses for our hearing today on "Confronting Climate Impacts and the Federal Strategies for Equitable Adaptation and Resilience."

The committee is adjourned.

Whereupon, at 11:20 a.m., the select committee was adjourned.]

United States House of Representatives
Select Committee on the Climate Crisis

Hearing on March 9, 2022
"Confronting Climate Impacts:
Federal Strategies for Equitable Adaptation and Resilience"

Questions for the Record

Dr. William Solecki
Professor, Department of Geography and Environmental Science
Hunter College—City University of New York

THE HONORABLE KATHY CASTOR

1. **The IPCC's latest report provides a stark warning about the climate impacts that are accelerating and could become irreversible for some of our most vulnerable landscapes and communities. In your testimony, you noted that there is an increasing gap between adaptation action taken and what is needed. This adaptation gap is even bigger in lower income communities and for communities of color. What steps should Congress take to address this adaptation gap and ensure that a national adaptation plan addresses the needs of marginalized communities?**

The WG2 Summary for Policy Makers Report directly addresses how reduce the adaptation gap emerging with communities. Specifically, the report focuses on the role of enabling conditions that reduce the adaptation gap. Key enabling conditions include political commitment and follow-through, institutional frameworks, policies and instruments with clear goals and priorities, enhanced knowledge on impacts and solutions, mobilization of and access to adequate financial resources, monitoring and evaluation, and inclusive governance processes.

It was found that political commitment and follow-through across all levels of government accelerate the implementation of adaptation actions. Implementing actions can require large upfront investments of human, financial and technological resources, while some benefits could only become visible in the next decade or beyond. Accelerating commitment and follow-through is promoted by rising public awareness, building business cases for adaptation, accountability and transparency mechanisms, monitoring and evaluation of adaptation progress, social movements, and climate-related litigation in some regions.

Institutional frameworks, policies and instruments that set clear adaptation goals and define responsibilities and commitments and that are coordinated amongst actors and governance levels will strengthen and sustain adaptation actions. Sustained adaptation actions are strengthened by mainstreaming adaptation into institutional budget and policy planning cycles, statutory planning, monitoring and evaluation frameworks and into recovery efforts from disaster events. Enhancing knowledge on risks, impacts, and their consequences, and available adaptation options do promote societal and policy responses. Furthermore, a wide range of top-down, bottom-up and co-produced processes and sources can deepen climate knowledge and sharing, including capacity building at all scales, educational and information programs, using the arts, participatory modelling and climate services, Indigenous knowledge and local knowledge and citizen science. These measures facilitate awareness, heighten risk perception and influence behaviors.

Inclusive governance that prioritizes equity and justice in adaptation planning and implementation leads to more effective and sustainable adaptation outcomes. Vulnerabilities and climate risks are often reduced through carefully designed and implemented laws, policies, processes, and interventions that address context specific inequities such as based on gender, ethnicity, disability, age, location and income. These approaches, which include multi-stakeholder co-learning platforms, transboundary collaborations, community-based adaptation and participatory scenario planning, focus on capacity-building, and meaningful participation of the most vulnerable and marginalized groups, and their access to key resources to adapt.

With adaptation finance, enhanced mobilization of and access to financial resources are essential for implementation of adaptation and to reduce adaptation

gaps. Building capacity and removing some barriers to accessing finance is fundamental to accelerate adaptation, especially for vulnerable groups, regions and sectors. Public and private finance instruments include grants, guarantee, equity, concessional debt, market debt, and internal budget allocation as well as savings in households and insurance. As such, public finance is a critical enabler of adaptation. Public mechanisms and finance can leverage private sector finance for adaptation by addressing real and perceived regulatory, cost and market barriers, for example via public-private partnerships. Financial and technological resources enable effective and ongoing implementation of adaptation, especially when supported by institutions with a strong understanding of adaptation needs and capacity.

Monitoring and evaluation (M&E) of adaptation also are critical for tracking progress and enabling effective adaptation. M&E implementation is currently limited in the U.S. Although most of the monitoring of adaptation is focused towards planning and implementation, the monitoring of outcomes is critical for tracking the effectiveness and progress of adaptation. M&E facilitates learning on successful and effective adaptation measures, and signals when and where additional action may be needed. M&E systems are most effective when supported by capacities and resources and embedded in enabling governance systems.

2. The IPCC report emphasized the importance of connecting climate mitigation, adaptation, and economic development. What opportunities do you see to better integrate climate mitigation and adaptation in federally supported economic development?

The WG2 Report Summary for Policy Makers focuses on opportunities presented by Climate resilient development (CRD) that integrates adaptation measures and their enabling conditions with mitigation to advance sustainable development for all. Climate resilient development involves questions of equity and system transitions in land, ocean and ecosystems; urban and infrastructure; energy; industry; and society and includes adaptations for human, ecosystem and planetary health. Climate resilient development is enabled when governments, civil society and the private sector make inclusive development choices that prioritize risk reduction, equity and justice, and when decision-making processes, finance and actions are integrated across governance levels, sectors and timeframes. Evidence shows that climate resilient development processes link scientific, Indigenous, local, practitioner and other forms of knowledge, and are more effective and sustainable because they are locally appropriate and lead to more legitimate, relevant and effective actions. Government efforts that advance climate resilient development account for the dynamic, uncertain and context-specific nature of climate-related risk, and its interconnections with non-climate risks, such as poverty, lack of education, and underemployment.

Overall, government institutions that enable climate resilient development are flexible and responsive to emergent risks and facilitate sustained and timely action. Governance for climate resilient development is enabled by adequate and appropriate human and technological resources, information, capacities and finance. Climate resilient development practiced in communities is observed to be more effective if it is responsive to regional and local land use development and adaptation gaps, and addresses the underlying drivers of vulnerability. Urban communities are critical place for enabling climate resilient development, especially those along the coasts. The greatest CRD related gains in well-being can be achieved by prioritizing finance to reduce climate risk for low-income and marginalized residents. Coastal cities and settlements make key contributions to climate resilient development through their vital role in national economies and inland communities, national and global supply chains, cultural exchange, and centers of innovation.

3. How can the federal government better respond to the needs of small island and developing states that are facing dire climate impacts today and in the near term?

The IPCC AR6 WG2 Report presents evidence on how many small island and developing states are facing an existential threat from climate impacts. Many increasing climate risks are present including water and food insecurity, extreme heat, and flooding, sea level rise poses a distinctive and severe adaptation challenge as it implies dealing with slow onset changes and increased frequency and magnitude of extreme sea level events which will escalate in the coming decades. Such adaptation challenges would occur much earlier under high rates of sea level rise, in particular if low-likelihood, high impact outcomes associated with collapsing ice sheets occur.

Soft limits to some adaptation in small islands and developing states has been reached, but can be overcome by addressing a range of constraints, which primarily consist of financial, governance, institutional and policy constraints. Inequity and poverty also constrain adaptation, leading to soft limits and resulting in disproportionate exposure and impacts for most vulnerable groups. Lack of climate literacy

at all levels and limited availability of information and data pose further constraints to adaptation planning and implementation.

A key policy goal should be enable adaptation via strategies that promote governance capacity, financing, and advancing new knowledge of risk and the effectiveness of existing adaptation strategies (A fuller discussion of these strategies is presented in the response to question #1 present above). It is critical that the strategies focus both on needs widely present as well as issues relevant to specific risks or social or geographic context. For example, responses to ongoing sea level rise and land subsidence in low-lying coastal cities and settlements and small islands include protection, accommodation, advance and planned relocation. These responses are more effective if combined and/or sequenced, planned well ahead, aligned with sociocultural values and development priorities, and underpinned by inclusive community engagement processes.

THE HONORABLE MIKE LEVIN

1. The IPCC Working Group Two report underscores how climate adaptation can help human populations and natural systems better deal with existing hazards and reduce future risk. However, it also acknowledges that adaptation alone, without parallel decarbonization efforts, will not be enough to stem the worst impacts of climate change. Can you explain why climate adaptation efforts can only be effective when paired with reductions in greenhouse gas emissions?

The IPCC AR6 WG2 Report and Summary for Policy Makers concludes that the level of global climate risk has increased and is projected to increase further in the coming decades. The Report highlights that while adaptation efforts in the short term can reduce vulnerability and enhance resilience, the rate of climate change if left unaddressed will overwhelm adaptation efforts structurally (i.e., exceeding the resilience capacity) or financially (i.e., increase in the potential cost of adaptation). Equally concerning is that ever more demanding adaptation strategies increase the prospect for maladaptation or adaptation strategies that result in unwanted or unexpected social, economic, or ecological outcomes. By integrating aggressive adaptation and mitigation, the burden of developing and implementation radical or extreme adaptation scenarios can be significantly lessened for many sectors and regions.

Overall, the assessment determines that embedding effective and equitable adaptation and mitigation in development planning can reduce vulnerability, conserve and restore ecosystems, and enable sustainable development. This twin policy approach is however especially challenging in localities or settings with persistent development gaps and limited resources. It is clear that dynamic trade-offs and competing priorities exist between mitigation, adaptation, and development. It was concluded that integrated and inclusive system-oriented solutions focused on adaptation and mitigation and based on equity and social and climate justice can reduce risks and enable sustainable development.

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Questions for the Record

Dr. Lara Hansen
Chief Scientist & Executive Director
EcoAdapt

THE HONORABLE KATHY CASTOR

1. **The IPCC report emphasized the importance of connecting climate mitigation, adaptation, and economic development. What are your views on this?**

Climate mitigation and adaptation are actions that we must take because the physical world is requiring it due to our historic greenhouse gas emissions. There is simply no choice given the impacts we are and will continue to experience. In the case of economic development, we can take actions that assist in this response or that exacerbate it further. Global economic development to foster greater equity and sustainability across countries could be made possible by a rapid transition to a system that is based maximizing energy efficiency and generating power through distributed renewable energy. There is also indication, as evidenced by current events, that this would increase political stability.

2. **The IPCC report also emphasized the importance of avoiding maladaptation. What examples have you seen of maladaptation and how can we avoid it in federal programs?**

Maladaptaiton most often occurs when the perspective applied to adaptation planning and implementation is too narrow. Example of this include when:

- **spatial scale is too small** (e.g., only considers one jurisdiction, doesn't not account for the source of a resource or the connectedness of s system),
- **timeframe is too short** (e.g., only considering the impact over the next 10–20 years when the life expectancy of the resource or infrastructure accounts for a much longer investment, such as 100 years for a bridge),
- **only a single climate impact is considered** (e.g., planning for sea level rise but failing to identify the impact of increasing temperature or ocean acidification or changing precipitation patterns),
- **climate change impacts are considered in isolation from other stressors** also affecting the community or ecosystem (e.g., contaminants, lack of affordable housing, energy demand, gentrification), and
- **sectors are considered individually rather than holistically** (e.g., developing adaptation strategies for water and for agriculture separately).

Unfortunately, the piecemeal approach we currently have to adaptation in the United States, predisposes us to developing maladaptation owing to a lack of mandate, funding and technical capacity to undertake holistic adaptation. The science and data exist to guide it, but the will and resources to make it happen do not.

3. **The IPCC report promoted the integration of equity into adaptation measures on a global scale. How might doing so address the long-standing injustices felt in some communities in our country?**

Responding to climate change gives us a unique opportunity to correct myriad past wrongs. It allows us to reconsider how resources have been distributed and past risk unfairly assigned, by requiring explicit reevaluations of these aspects of society in relation to climate change. Things that seemed foregone conclusions of policy and practice, are now themselves vulnerable to climate change, allowing us to develop new strategies that are equitable. But this will only happen if we do the work to fully understand the implications of climate change, then develop solutions that earnestly endeavor to create an equitable circumstance going forward. There are many lessons to be learned from equitable adaptation being undertaken in other countries and the major issues of global North/South equity in the mitigation and adaptation spaces.

4. **Talk us through some of the barriers a local government or community might face trying to develop and implement a climate adaptation plan, and how the federal government can help overcome them?**

There are barriers at each step of the process, but with those are opportunities for improvement.

1) Determining you will undertake climate change adaptation.
Barrier: Lack of knowledge that this is something a community can undertake. Lack of political will.
Federal Opportunity: Create requirements for federal support that climate adaptation plans be in place to be a recipient.
2) Determining how you will undertake climate change adaptation.
Barrier: Lack of clear approach to how this should be undertaken.
Federal Opportunity: Create standards of practice that are easily accessible, easy to understand, and linked to support. Tools like Climate Smart Conservation[1] are great models.
3) Finding Capacity to undertake climate change adaptation.
Barrier: Lack of local capacity to undertake a climate adaptation plan. Most communities do not have dedicated staff, nor do they know where to find external support.
Federal Opportunity: Create climate change adaptation training opportunities in more fields. Currently the National Conservation Training Center does a great job of providing adaptation training for conservation professionals but there are few other sectors for which there are curriculum, tools and training for professionals.
4) Finding information to undertake climate change adaptation
Barrier: Users don't know where to look and don't have the capacity (see above) to know how to apply it.
Federal Opportunity: Climate Explorer[2] is a great resource supported by federal agencies to get data to users. Systems like Coral Reef Watch[3] are a model for how to pair data with user needs. We need better access by all to Climate Explorer and more pushing of data to users like Coral Reef Watch.
5) Finding funding to undertake climate change adaptation
Barrier: There are both a perceived and real funding shortfalls for climate change adaptation.
Federal Opportunity: In addition to making more funds available for adaptation, it is also essential that all funds be spent in a climate smart manner. As mentioned above, making climate change adaptation a requirement for the expenditure of funds will ensure that we are not taking actions (building infrastructure, designing social systems, protecting wildlife) that are not resilient to climate change, which in turn will help us avoid making our problems worse.
6) Implementing climate adaptation
Barrier: Analysis paralysis and lack of follow through. Currently too much adaptation never advances beyond the development of a vulnerability assessment or an adaptation plan. We are falling short on implementation.
Federal Opportunity: Require climate change adaptation be inherent parts of any local actions. Just like ensure you have money and staff to undertake a project, it must also take climate change into account (mitigation and adaptation ideally).
7) Monitoring and evaluating your adaptation actions to ensure they work
Barrier: Very little monitoring and evaluation happens in general.
Federal Opportunity: We are behind the curve on climate change adaptation. The problems of climate change are increasing and we have not learned enough about what actions confer advantage. We need to learn and we need to do it quickly. This will require monitoring and evaluation of the processes, plans and outcomes to ensure we are making good choices and have information to share with others that follow.
8) Sharing your monitoring and evaluation outcomes
Barrier: Clear paths of sharing are under-resourced. The largest database of climate change adaptation solutions is run by a non-profit (EcoAdapt where I work) and has a staff of one. We need to expand this.
Federal Opportunity: Support databases such as the Climate Adaptation Knowledge Exchange (CAKEx.org)[4] and have federal programs share learning through them with interconnectedness of access nodes and content. Additionally, person to person events like the National Adaptation Forum[5] (in person and virtual) offer real time exchange of ideas that can allow for not only sharing of lessons but innovation of new approaches built on collective experience.

5. In your experience, what are the most successful strategies for helping communities adapt that we should include in a national adaptation plan?

When communities have access to a clear mandate (what they are aiming for), understandable climate information, staff with capacity, community champions who support the effort, allocated funds to undertake the work, and a means of monitoring their progress, they can make adaptation happen. None of this is extraordinarily expensive but it does all have to be there. A National Adaptation Plan could provide the mandate, access to climate information, staff capacity, funds and monitoring. With the increased awareness created by those five elements, the local community champions will likely make themselves known.

THE HONORABLE MIKE LEVIN

1. **In your testimony you highlighted how the U.S. is already experiencing increased wildfire risk due to climate change and how we need to develop climate adaptive strategies to minimize the impacts and severity of wildfires. Over the last four years, California communities have suffered from seven of the largest fires in state history. These fires, including the August Complex fire, Dixie fire, Monument fire, Caldor fire, and Beckwourth complex fire, collectively burned over 2.5 million acres and destroyed or damaged over 30,000 structures. With climate change, we know that we cannot just prepare for a fire season but must now deal with this threat year-round. And we know that wildfire risk will only continue to increase, with the United Nations Environment Program recently finding that the likelihood of extreme wildfires is expected to increase up to 14 percent by 2030 and up to 50 percent by 2100 as a result of climate change and changes in land use. Can you expand on how wildfires can sometimes lead to greater greenhouse emissions?**

Generally when I hear this question I think I'm being asked about emissions from the fire itself. And it is true, fires emit carbon. Fires such as the burning of peatlands in Indonesia can have massive greenhouse gas emissions. Fires in North America emit carbon as well. Although the emissions amount depends on the fuel load and the heat of the fires. However it is important to note that the burning of trees, plants and soils is the release of what is known as biological carbon. It is carbon that is very labile. It moves as the plants photosynthesize, respire, grown, die, and decompose. This is moving quickly in and out of the atmosphere if you think about it on a geological timeframe. Yes, in the near-term it is more carbon in the atmosphere but its part of the baseload of carbon that has been moving in and out of the atmosphere regularly. The real additive concern for climate change is from fossil carbon.

Fossil carbon (from coal, oil, and gas) is largely fixed until we extract it, refine it and burn it. In wildfires there is also a significant fossil carbon source greenhouse gas emissions pattern. When houses burn they contain a good deal of fossil carbon from everything the house contains that is made of synthetic materials derived from fossil materials.

Large amounts of fossil fuel energy are also used to try and prevent fires (e.g., trucks, chainsaws, bulldozers), fight fires (e.g., firetrucks, helicopters, airplanes) and recover from fires (e.g., construction equipment, movement of goods to rebuild)—all of which result in increased emissions. I was struck last summer as sat on the shore of Silver Lake in California as the helicopters came in again and again to get water to deliver to the Tamarack Fire that this was a very energy intensive approach to solving a growing problem. How could we possibly keep up?

2. **How can communities responsibly adapt to increased wildfire risk and address the acute health risks posed by wildfires without compounding our climate challenges?**

This is a considerable challenge. I live in a community where for at least one week each summer (often several) we are relegated to staying indoors with air filters whirring to reduce our exposure to harmful air from wildfires often hundreds of miles away. We are thankful that it is relatively cool where we live but you can see the added complexity of needing to run filters and air conditioning—which is many regions of the west are run on electricity generating by burning goal or gas. Clearly just making the problem worse. What can we do to improve this?

- Only generate electricity in a manner that does not emit greenhouse gases. In other words convert to all renewable, thermally resilient (not vulnerable to elevated temperatures) electricity to power our household, manufacturing, business and transportation needs.
- Update building code to have greater energy efficiency and proper air filtration options.

- Update land use planning to ensure shade and buffer zones.

3. Can you also share any examples of how communities have successfully built resilience and adapted to the impacts of increased wildfire risk and extreme heat?

Successful is a hard bar to meet here for two reasons. First, as I mentioned previously, and in my testimony, we have not done enough to monitor and evaluate the effectiveness of our adaptation ideas, processes, actions and outcomes. This is not due to an inability to do this, rather it is due to a lack of funding to support it and requirement to undertake it—both things Congress can address. With fire and heat occurring on an increasing basis there is plenty of opportunity to assess how well an action to reduce vulnerability to these stressors does or does not work. We don't need to wait until fifty years from now to see how we did, we can be learning right now, using those lessons to modify our actions and sharing them with other communities so they can move more quickly to more successful actions. My organization is undertaking a concerted effort to develop monitoring and evaluation guidance, undertake our own efficacy assessment in various sectors and support broader scale adoption. I am happy to share some of those products and tools with you at your request[6]. Second, what success looks like to different communities at different times will vary. Does success mean suppressing fire on the landscape scale as we did for over a century? Does it mean creating a firesafe perimeter so your community does not burn but the landscape around it does? Does it mean moving communities out harm's way? Does it mean reducing the wildland/urban interface by reducing sprawl so communities stay out of harm's way? There are examples of all of these, but for some each of these solutions will not be seen as successful and for others they will. If you would like to see examples of how communities have taken action to address climate change, including wildfire and extreme heat, head on over to the Climate Adaptation Knowledge Exchange's case studies collection (https://www.cakex.org/resources/type/project) and search for "wildfire and heat" in the search box, or use the key word on the right hand side. You will get hundreds of examples from across the country and a few from around the world. I would be happy to explore this data with you more closely if you are interest.

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Questions for the Record

The Honorable Matthew Jewell
President
St. Charles Parish

THE HONORABLE GARRET GRAVES

1. President Jewell, we know that collaboration between states and the Federal government is important in developing resilience and mitigation strategies. The IPCC's latest report "Climate Change 2022: Impacts, Adaptation and Vulnerability," states that "effective partnerships between governments, civil society, and private sector organizations" are needed.

a. Do you think FEMA's changes to the National Flood Insurance Program through Risk Rating 2.0 are an example of an effective partnership between Louisiana and the Federal government, es-

pecially considering that many of us in Louisiana have continually made FEMA aware of the drastic rate increases that will occur due to the changes they've made to their methodology?

The roll out of Risk Rating 2.0 is not an example of an effective partnership between Louisiana and the Federal Government and even less so with local governing officials who are closest to the issue. We have been raising valid concerns about the modeling and methodology even prior to the implementation of this new policy but it has fallen on deaf ears. When we have approached FEMA with questions about data they are using in its new system, they cannot provide clear responses and we are left with more questions than answers.

2. **The IPCC's report also noted that, for coastal communities, these strategies are best deployed when "aligned with sociocultural values and development priorities."**

    a. **Can you explain whether or not you think that Risk Rating 2.0 is a policy that is aligned with coastal communities' interests to invest in important mitigation tools?**

Louisiana is a working coast. Whether you are a commercial fisherman, a shipbuilder or work in the tourism industry; people who live here rely on the coast for their livelihoods. FEMA's new risk rating policy threatens those who live here by making it financially unaffordable to remain here and potentially bankrupting them by devaluing their largest investment, their homes.

3. **Instead of pursuing policies the way FEMA has over the last year—taking administrative action without effectively engaging the public—can you share your perspective on how the Federal government can be a more effective partner to develop resilience and more effectively protect our communities?**

First and foremost, FEMA should be working with local governments to help them mitigate their risks. The President has stated that for every dollar invested in mitigation, it saves six dollars in mitigated damages. There has been billions of dollars invested, both federally and locally to mitigate flooding from storm surge and torrential rain in Southeast Louisiana. We need to ensure that that investment is factored into the premiums that residents pay and there needs to be continued investment in future mitigation.

4. **You spend your days interacting with Louisianans and helping them solve problems within St. Charles Parish. What impact will Risk Rating 2.0 have on the people you and I represent?**

We are already seeing the impacts of Risk Rating 2.0. As you are aware, the first phase of this program became effective on October 1, 2021 and impacts new policies. Residents seeking to build new homes are walking away due to the exorbitant increases to flood premiums. Many of these new policies are as much as 10 times the cost of the existing policies.

Most residents with existing policies are going to see an increase of 18%, the maximum allowed by Congress, year over year until their policies become unaffordable. This increase on top of the highest inflation we have seen in the last 40 years and recent increases to property insurance premiums will have a devastating impact on the housing economy.

Questions for the Record

Dr. Lauren Alexander Augustine
Executive Director
Gulf Research Program
National Academies of Sciences, Engineering, and Medicine

THE HONORABLE KATHY CASTOR

1. **How can the federal government better support efforts in the Gulf Coast Region to reduce greenhouse gas pollution and increase resilience through a more comprehensive or holistic approach?**

The Gulf Coast Region faces a particular challenge in reducing greenhouse gas emissions because of its disproportionate role in oil and gas production and petrochemical manufacturing. The region also is subject to many climate and weather re-

lated risks that result in elevated vulnerability to sea-level rise, intense hurricanes, flooding from more intense rainfall (including pluvial flooding), and tornadoes in the Gulf States. These phenomena combined with social inequity and deep pockets of poverty challenge resilience in the region. Efforts both to reduce emissions to achieve net-zero and increase resilience can and should be brought together in an integrated approach.

This type of integration could most easily be tested or piloted in areas where climate mitigation and adaptation actions coexist. Within the Gulf Coast Region, the State of Louisiana has developed both a Coastal Master Plan to address resilience and a Climate Action Plan—the first in the Gulf South—to achieve net-zero emissions objectives. At a regional level, Houston has also developed a Climate Action Plan that accelerates renewable energy and engages the oil and gas and petrochemical industries in approaches to reduce substantial emissions. As part of the long-term recovery from Hurricane Harvey (2017), Houston also has the Resilient Houston strategy. In Florida, Tampa Bay Regional Planning has also developed a Regional Resiliency Action Plan.

The federal government should develop strategies to assist these important state and regional initiatives by providing funding, technical assistance, and interagency coordination. The regional offices of federal agencies such as FEMA, NOAA, the U.S. Army Corps of Engineers, EPA, and USGS (and others) could contribute to an all-of-government approach exercised at the regional level with a commensurate level of coherence and urgency.

2. The IPCC report emphasized the importance of avoiding maladaptation. What are the risks of maladaptation and the unintended consequences of tackling climate change? How are you working to avoid maladaptation in the Gulf region?

As the IPCC report points out, actions intended for climate change adaptation can backfire and can increase vulnerability rather than decreasing it. They can increase existing vulnerability or reinforce existing inequalities in its distribution. Adaptation actions may just redistribute vulnerability, reducing risks in one place while increasing them elsewhere. Furthermore, adaptation efforts focused on near-term risks can inadvertently introduce longer-term risks.

The Gulf Research Program's work on enhancing resilience for Gulf Coast communities focuses on the social determinants of health to ensure that adaptation does not reinforce or perpetuate existing health disparities. Our programs seek to support climate adaptation projects that produce co-benefits, improving human health and well-being through equitable and community-driven climate hazard mitigation. Our program on sea-level variation and rise in the Gulf aims to provide forecasts and projections based on the latest science. This GRP work provides the needed evidence base to help avoid the high economic and social costs of excessive adaptation while also avoiding insufficient adaptation.

3. Talk us through some of the barriers a local government or community might face trying to develop and implement a climate adaptation plan, and how the federal government can help overcome them?

When local communities or governments begin to design or implement a climate adaptation plan, scale may be a difficult challenge. Communities often try to adapt to the most pressing conditions within their jurisdiction that were—or are—created beyond their jurisdictional boundaries. Communities' adaptation successes can be realized most easily when a single jurisdiction can control for the sources of and the impacts from a risk or a hazard. Thus, we see many examples of resilience efforts focused at the site scale (e.g., buildings, grading, etc.), since local jurisdictions can establish and enforce things like building codes, stormwater designs, required set backs, and even allowable materials. In order for small jurisdictions to tackle larger adaptation and resilience issues –greenhouse gas emissions or environmental justice, for example—they may need assistance to find local solutions to problems caused by regional or external forces. The federal government could play a role that provides information resources, enforceable regulations and limits to environmental releases, technical assistance, or financial resources to expand the effect of local solutions.

4. How can we better shape federal policy to incentivize adaptation measures before disasters strike? Can you expand on the current state of funding for pre-, during, immediate post- and long-term post-disaster funding?

The federal government plays a critical role in helping the people of this country survive and recover from disasters. The federal government provides or augments disaster relief and response services, recovery resources, and even opportunities to

mitigate the worst of the impacts experienced during a disaster. Through the Stafford Act and presidentially declared events, disaster relief funds and the pre-disaster mitigation grants are administered by FEMA. The most visible benefits are seen during the response phase—lifesaving, evacuation, and sheltering functions through the worst parts of an event and in the immediate after effects. Long-term recovery money for presidentially declared disasters often counts in the billions delivered over multiple years, mostly through community development block grants and other programs administered through US Housing and Urban Development.

Outside of Stafford authorities, there exists a range of federal agencies have various pre-disaster adaptation, resilience or mitigation programs. NOAA, NASA, DOE, and other agencies work with industry, regulators, or communities to provide incentive and in some cases technical assistance to enhance adaptation to climate change.

Numerous studies have outlined the financial benefit of pre-disaster mitigation investments with returns on those investments tallying anywhere from 1:6 to 1:11. State and regional jurisdictions are interested in the benefits of pre-disaster mitigation and adaptation efforts to reduce the impacts and costs to their jurisdictions should a disaster occur. Now, through the Building Resilient Infrastructure and Communities program at FEMA, 6% of the Disaster Relief Fund is dedicated to disaster mitigation.

There ae a few problems with this constellation of federal assistance and programming. First, the various programs are not coordinated with each other, including the programs that are administered under the purview of one agency. A great advantage would be for the diverse federal pre-disaster programs to become coordinated or at least aligned with each other, with applications that are harmonious in format and timing with each other. Another problem is that the applications themselves can be complicated and burdensome to applicants. Often, consultants are hired to complete the applications; as such, there is an implicit bias against under-resourced communities in applying. Those communities that have the resources to hire consultant firms produce the most compelling proposals and they are at a distinct advantage over the communities that are relegated to completing their applications on a low budget, with a small staff, or at low capacity. Perhaps one option would be to seek some sort of common application that could be slightly adapted for different funds across federal agencies. Such a "common app" would substantially reduce the administrative and application burden on the jurisdictions seeking funds. Connecting various federal disaster programs together would also result in State, Local, Tribal jurisdictions building resilience across the full arc of activities that would allow them to connect the long-term recovery resources with mitigation and adaptation funds to reduce the impacts of disasters over the long term.

5. Some communities across the country are highly dependent on a fossil fuel economy for their livelihoods. They are also often co-located in communities of color. How can we help these communities navigate the transition towards a just, resilient, and sustainable economy?

Because of a sizable presence of fossil-fuel-related industries along the Gulf Coast, particularly along the central and western Gulf, many communities are economically dependent on these industries. Many communities of color have experienced deleterious health and environmental effects. Sometimes, the affected communities receive some of the economic benefits associated with the industry, like well-paying jobs, but oftentimes the people of the impacted communities do not. Petro-chemical plants, oil refineries, and major oil and gas infrastructure contribute to environmental injustices over generations. As we undergo the energy transition from fossil fuels towards net-zero emissions, it is incumbent on the policy and decision makers to ensure that these communities are afforded a voice and opportunities related to their future and remediation to restore those communities to health or other alternatives for healthier communities. The goal should be to achieve economies that are more just, resilient and sustainable. As renewable energy replaces fossil fuels, we will need to consider ways for the new energy economy to improve living conditions and provide safe, stable work and job opportunities; ways to create new economic opportunities for local communities; and options to activate, build and sustain capacity within the local workforce to fill these jobs. To be sure, to the extent there is a role for the use of fossil fuels—through carbon capture and storage, blue hydrogen or innovations in chemical manufacturing—let us ensure that we do not repeat the unjust mistakes and decisions of the past that would sustain or exacerbate risks to fence-line communities. We need to explore the options, understand the tradeoffs, make strategic investments and avoid the negative externalities that disproportionately impact the communities that have already borne the brunt of environmental degradation for generations.

6. You have personally worked with adaptation efforts across many levels both inside and outside of government. Could you share a successful example of adaptation that you have seen implemented that also addressed equity and justice concerns? Is there any key characteristic about that example that would be beneficial to highlight?

Regions around Charleston, South Carolina are prone to flooding. Through Resilient America (at the National Academies), we worked closely with the Charleston Resilience Network on measuring flood resilience. The communities most prone to flooding are communities of black and brown people, and non-native English speakers. When we discussed how to approach the social dimensions of flooding, someone from the South Carolina Aquarium noted that "everyone loves sea turtles." It was an odd statement, given the topic at hand, but then he went on to explain: the sea turtles habitat is the same coastal, low lying areas where the flooded populations live. If we sought to protect the sea turtle habitat, we could also institute some flood protection for the people who live in similar habitats. So the lesson here was that sometimes, you need to exercise some creativity. The key is to find multiple benefits in single points of investment; and, in this case, using how "everyone loves sea turtles" to build flood resilience for the people who share the turtles' habitat in the lowest-laying, flood prone areas.

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